FOOD MANUFACTURE
MAY 25 1938

FOOD MANUFACTURE

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F.O.I.

A JOURNAL DEVOTED TO THE PRODUCTION AND MANUFACTURE OF: Chocolate, Confectionery, Biscuits, Bread, Cake; Jam; Glacé, Candied and Preserved Fruits; Fruit Juices and Cordials; Jellies, Honey and Lemon Curd; Cheese and Milk Products, Infant, Breakfast and Invalid Foods; Ice Cream; Canned Foods; Meat, Fish and Vegetable Products; Soups, Pickles, Sauces, Pastes and Extracts, and all edible commodities involving a process of manufacture

FOOD MANUFACTURE

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The Editor will be glad to consider contributions from those engaged in the Food Industry. Articles intended for publication should be of a practical nature and accompanied by photographs or drawings when possible.

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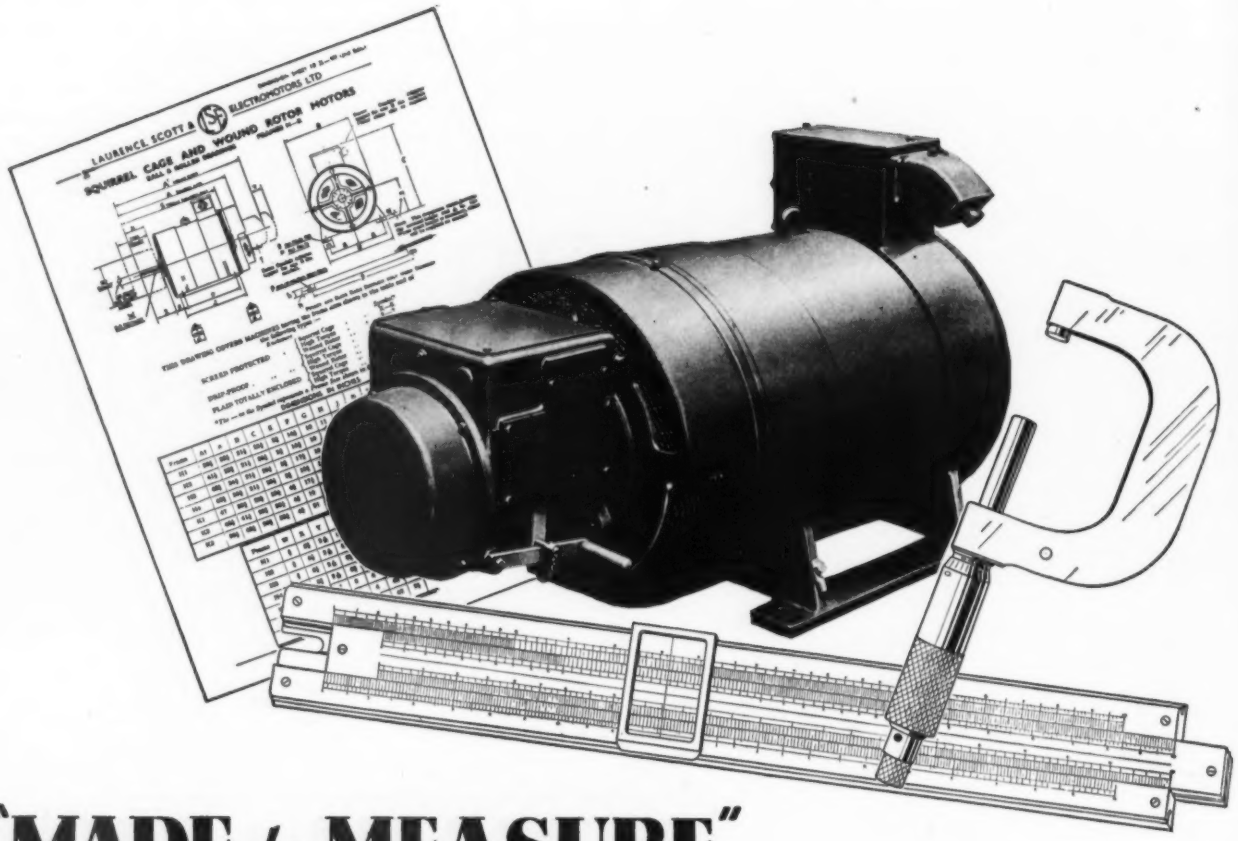

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FOOD MANUFACTURE

Vol. XIII, No. 5 May, 1938

More Silly Litigation

WE HAVE referred on several occasions to the growing habit of people bringing action against manufacturers on the grounds of finding some foreign and dangerous substance in an article of food. Recently a woman claimed damages in respect of personal injuries from Cadbury Bros., Limited. She said the chocolate was gritty and something cut her tooth, and she found that a piece of the tooth had been broken off. The Judge found that she had not proved that it was a piece of metal embedded in the chocolate which was caught in her mouth. He said that the risk seemed even more remote than one in ten millions and the complaints were not justified. Then there was the case of a Wandsworth woman who claimed for £30 damages in respect of caramels in which she alleged splinters of wood were found. The Judge said he was not at all satisfied that those minute fragments of wood were in the sweets when they were bought. It was much more probable that the sweets were dropped afterwards and picked up the wood. Even assuming that there were those fragments of wood in the sweets, the damage to the plaintiff was not by reason of that, but simply by reason of worrying herself on discovering the fragment. The case was dismissed. We hear of many cases where manufacturers are absolutely held to ransom by unscrupulous people who claim damages for articles they swear they have purchased. Usually the manufacturer pays up to avoid a fuss, knowing full well that it is a fraud. This constitutes one of the worst forms of blackmail, carried out to an enormous extent, which, if proved, should be punished severely.

Pre-Packed Goods

The Monthly Review of the Incorporated Society of Inspectors of Weights and Measures last month had a few editorial words to say on the subject of pre-packed unscheduled goods. Commenting on a paper by the Chief Inspector of Weights and Measures for Wisconsin at the Annual Conference at Washington, it points out that it reveals a disturbing feature of the development of the canned foods industry. In the U.S.A., where the trade in pre-packed articles is probably more highly developed than anywhere else, the requirement that containers should be marked in terms of weight or measure is more comprehensive than in this country, but from the statements in the paper referred to the regulations are far from satisfactory. When articles such as fruit, vegetables, etc., are canned in liquids, it is obviously undesirable for the quantity of the total contents to be stated in terms of liquid measure or of weight, since this gives no indication of the solid food content of the can. Tins of similar size vary enormously in the proportion of their contents. Some contain a large quantity of syrup or other liquid with very little food, while others have a reasonable content of fruit or vegetables. In this country the jam manufacturers tried to form a voluntary agreement to standardise the sizes of containers and the fruit content of jam, but to judge from recent proceedings the effort could scarcely be termed successful.

The Pectin Puzzle

Jam manufacturers and chemists will be interested in some work carried out by the British Association of Research for the Cocoa, Chocolate, Sugar Confectionery and Jam Trades and on pectin summarised in the report for the year 1936-1937 of the Department of Scientific and Industrial Research.

Pectin has long been a puzzle. "The dependence of the strength of pectin jellies upon acidity, or *p*H, and the absence of any direct connection between pectin concentration and jelly strength are well known. Previous attempts to explain the varying jelly-forming capacities of pectins in terms of their chemical constitution have met with little success.

"A new and promising line of approach to the problem of the mechanism of pectin jelly formation has now been brought to light. It has been found possible by applying current physico-chemical conceptions to pectins in solution and by

making certain assumptions, to provide an explanation of many of these apparent anomalies. The development of these ideas, moreover, leads to a quantitative basis of pectin jelly formation, and experimental results, obtained with a number of purified pectins extracted from fresh fruits on a fairly large scale, have so far been in accordance with the theoretical expectations".

An excellent example of the value of *a priori* methods of approach to scientific work, especially if the final results bear out the theories.

Storage Pests

The Association has for the past three years been carrying out research in conjunction with Colonial Departments of Agriculture to ascertain the points at which cocoa bean become attacked by insects on their way to this country.

It is reported that, "twenty-one special series of beans have been passed through the normal stages from cocoa estates to London and points at which attack by storage insects first occurred have been determined. In eighteen cases this proved to be either at the estate or on the way to the coast, while in three cases attack first occurred at the port of dispatch. It is hoped that the ascertainment of these facts will enable the colonial authorities to organise steps which will eventually result in a reduction of the losses occurring in a valuable raw material.

"The conservation and protection against attack of insects is a part of the general problem which faces those responsible for the storage of cereals and similar foodstuffs".

Soya Bean Milk

There are over 350,000 destitute Chinese in camps and elsewhere in Shanghai, and these, and particularly the children, are suffering great hardships from food deficiencies. A report has been received from the International Red Cross at Shanghai through the Lord Mayor's Fund, and according to this practically all of them are suffering to some extent from beriberi. An attempt is being made to prevent this by supplying them with soya bean milk and cakes which contain vitamin B_1. The milk is produced at one of the hospitals. After the beans have been soaked they are crushed in a motor-driven mill of a capacity sufficient to produce 15,000 lb. milk per day, but at present the cooking facilities are so limited that only 6,000 to 7,000 lb. are produced. The bean mash is mixed with water and slowly boiled and the hot solution delivered to the camps where sugar and calcium lactate are added. Each child is allowed a pound a day, but at present there is only enough milk available for half of the children. The residue after milk production is mixed with its own weight of whole wheat flour and baked into cakes. The best that most of the camps can do for the refugees is two meals a day of hot rice and a little vegetable, chiefly dried and salted turnip. Even this diet is getting scarcer and scarcer and funds to increase the production of soya milk would be welcome.

Soil Fertility

The series of lectures on the fertility of the earth, arranged by the Royal Institute, recently concluded by Sir Frederick Keeble, touched on a most important aspect of national economics and a problem which has received all too scant attention in the past. Sir Frederick Keeble was alarmed at the deterioration of physique and fertility in the human race and at the decreasing fertility of the soil. We wonder if there is any connection. He welcomed the development of grass farming at the expense of arable, but urged that the grass should be cultivated and used better. He condemned the widespread use of concentrated cattle foods and the making of hay which he asserted caused a big loss of salts and protein. Numerical data were produced to show the advantage of increasing the yield of grass by the proper use of fertilisers all through the year enabling stock to spend most of their time grazing, and to graze on newly mown grass in which nutritious and growth-promoting constituents had not given place to fibrous material only valuable as roughage. The main thesis was a plea for the recognition of the dictum that "all flesh is grass" and that much more attention should be paid to improving pastures. Better cultivation, restoration of humus, judicious manuring and addition of lime would all help. The production of crops by "hydroporics", as developed in the University of California, is also worth considering.

Skimmed Milk

Lady Astor's efforts in the House of Commons are always entertaining, and usually the noble lady comes off best. She had, however, rather the worse of her argument with Mr. Morrison on skimmed milk. As one would expect, she pounced on the Food Council's condemnation of the waste of 6½ million gallons of skimmed milk and asked the Minister what he intended to do about it in view of the stress laid upon its value as a nutritive food by the advisory committee on nutrition. Mr. Morrison skirted the issue neatly by challenging

the estimate of gallonage and pointing out that many manufacturers have no facilities for converting skimmed milk into a product which can be conveniently stored, handled and transported. Lady Astor rather missed her chance there, as it is obviously part of the job of the Milk Marketing Board to see that the milk could be handled properly. It could always be dried and used in the confectionery industry. Instead, she followed the herring and suggested that the Board, by the policy of throwing the milk away, were depriving thousands of children and other people of the benefit of this skimmed milk. Mr. Morrison seized his opportunity and pointed out that the Board do not pay rebates on skimmed milk when sold by the purchaser for liquid consumption as this would mean subsidising skimmed milk to the detriment of their own producers. He finished it off by saying, "What we want is that people should drink whole milk and not skimmed milk", which, of course, is quite true.

Fruit Juices in France

In recent years there has been a remarkable increase in the consumption of non-alcoholic beverages made from fruit on the Continent, although they have not become quite so popular in this country. With this increasing consumption there has been the growing possibility of careless manufacture, and it has become more and more desirable that legal safeguards should be adopted to protect the consumer. The French syndicate which was formed by the makers of these fruit juices has recently consulted the Academy of Medicine about the framing of such legislation. Some useful discussions have taken place which have cleared the air and should prove of great value to the prospective legislator when the time comes. It was agreed that no chemicals should be used for the preservation of these drinks. The only methods to be employed for this purpose must be physical—*e.g.*, pasteurisation, refrigeration, filtration, etc. Even the apparently harmless additions of colouring agents and perfumes were discouraged. On the other hand sugar in the form of saccharose may be added to correct excessive acidity and any tannin there might be present. Other recommendations endorsed by the Academy referred to nomenclature when the juice of more than one fruit is sold in the same bottle or when the juice has been concentrated or reconstituted. It is suggested that a label should be put on the bottles telling consumers to empty it there and then (a good selling regulation this!). The strongest feeling in the whole discussions was the hearty condemnation of chemicals of any sort.

Dried or Extracted Grass

We have made several references to the progress made in grass drying since we first mentioned it in 1933, and in June last year we dealt with Colonel Pollitt's paper on the subject before the Royal Society of Arts. Those of our readers who are interested in the subject should refer to a paper in the Journal of the Society of Chemical Industry entitled, "Value of Grass Extract and of Dried Extracted Grass in the Winter Rations of the Dairy Cow". Feeding experiments were made with 16 shorthorn cows in order to determine the value of grass extract and of dried extracted grass in the winter ration and the carotin content of the milk produced was determined. The essential features of the process for the preparation of the grass extract and the extracted grass (a recent innovation) are the passage of the grass through a hot bath of juice from previous extractions, followed by crushing between rollers, and evaporation below 50 deg. C. under reduced pressure to a syrupy consistence. The extracted grass is then dried and baled. The results of the examination as to yield of the milk, butter fat and solids not fat showed that neither the extract nor the residual grass gave better results than the ordinary foods used in the control ration. Determination of the carotin content of the milk shows that there had been a significant response to the inclusion of extracted grass in the ration, although the grass extract was without effect. It is concluded that for the partial replacement of an ordinary winter ration for dairy cows, extracted grass is as useful as young grass dried by orthodox methods.

Sound Breaks into Food Industry

"Sonic cavitation" is the picturesque term used for churning, emulsifying, and dispersing operations and for destroying bacteria. Mr. Leslie A. Chambers, writing in the March issue of *Food Industries*, describes the use of sound for these purposes. Sound waves under suitable control become the means by which mechanical energy is carried to points where it may be utilised, the wave playing a *rôle* analogous to that of the feed line to a hydraulic turbine or the conductor along which electrical energy reaches the winding motor.

If a two-phase liquid system such as mineral oil or butter fat be cavitated, the particles of the disperse phase are quite rapidly subdivided with the result that an emulsion is produced.

The homogenisation of milk has been accomplished with sound transducers of 360 cycles per second frequency, and the product is being marketed successfully.

One of the effects of intense sound waves first observed was the killing of bacteria in liquid suspensions. It has been found that pure cultures of bacteria, both harmless and pathogenic, can be sterilised by prolonged exposure to sonic cavitation produced by any sound frequency from 120 cycles upwards. If this bactericidal action can be applied economically to the sterilisation of fruit juices, beer, milk, or other liquids, it may prove of considerable importance.

Mr. Leslie A. Chambers adds that the industrial hazards of exposure to very intense sounds have not been thoroughly investigated, and unless the vibrating units can be separated from the workers by sound-proof structures, we can visualise added burdens to the lives of food operatives.

Meat Products

Some interesting work has been carried out during the year by the British Food Manufacturers' Research Association, a description of which also appears in the report above mentioned.

The matter of obtaining a gelatin jelly in meat products which will not melt so readily at summer temperature, thereby rendering such meat packs practically unsaleable, has constituted a problem for packers for many years past, and it is interesting to note that the Association is trying to tackle it.

Some packers have resorted to the use of agar agar, but this is taking the line of least resistance, as, although this substance is perfectly edible, its appearance cannot compare with gelatin.

The Association is carrying out experiments, applying new technique to the determination of melting points; examining different grades of gelatin and their preparation for the purposes of meat packs.

"Black spots" in meat packs have been a *bête noir* to meat packers, and have occupied the attention of packers for a considerable time. A classic example was that of canned sweet corn in the U.S.A., and in this case the trouble was practically eliminated as a result of much research.

In meat canning, blackening of the tin (and sometimes the meat itself) arises from the combination of volatile sulphur compounds, liberated from the protein molecule, with the iron of the container. It is not entirely a matter of exposed iron on the tin-plate. There is an inevitable proportion of iron existing in the tin covering of the plate, taken up by the tin during the manufacture of the plate, and this is sufficient to produce blackening when the plate is exposed to sulphur compounds.

The problem is no longer a serious one to the majority of packers, but any fresh light that can be thrown upon it will be valuable.

Other subjects which are being dealt with are the penetration of heat into packages of different kinds and sizes filled with different types of products and the pressure developed in these packages during sterilisation.

Hunger

In this issue there are reviews of two food books, widely differing in treatment, but both mentioning *hunger* as a definite menace to this country in case of war.

There is an ideal point between the extremes of optimism and pessimism. As Lord Lymington says, "None respects the fearful or the fool. As we are now, we are not fearful but fools. We are fools not to be fearful, since nothing will avail us until our rations are in the granary or growing in a soil made bountiful by our service and our foresight. A generation of peace and quietness has left us only the security of folly, hence, we must turn to fear".

It seems a great pity that fear should have to be the stimulant which impels the carrying out of what might appear the most reasonable and almost obvious precautions.

Let us turn for a moment to the other extreme. Writing in the *Evening Standard*, Mr. Frank Owen pooh-poohs the whole war business, he says, "Germans won't fight because they can't fight the French and the Russians".

> "Some daub his visage with the Smoke of Hell. . . .
> He's a good fellow and 'twill all be well."

This is not exactly the view taken by this optimist towards the dictators, but we are certainly assured that, "there will be no great war in Europe".

We deprecate such attempts at "bull-dosing" the highly suggestible British public and favour a middle course with a distinct bias towards the fearsome state of mind, which seems to be the only one that will conduce to getting things done. As Lord Lymington further remarks, "If we can face the future with fear we can prepare, then we will have unity to restore our purpose. Except for that, only cataclysm can unite us, and then too late".

Jam Manufacture Today

The principal technical aspects of jam-making from the production point of view

S. V. POULTNEY

IN THESE days of general scientific development it is interesting to note that the movement towards rigid chemical control of jam manufacture appears to have slowed down somewhat. This is not because of any desire or need for relaxation of control, but because a better understanding has sprung up between the practical and the scientific sides of the trade. Science has developed and proved the value of standardised methods for producing jams of high and regular quality. Moreover, the raw materials of jam manufacture, especially those which undergo some initial preparation or are themselves manufactured products, have been improved enormously by reason of scientific control, and this is naturally reflected in the finished jam. Apart from this, however, there is an almost universal acceptance of the thermometer and refractometer as aids to jam boiling, greatly to the benefit of both the manufacturer and the buying public.

Broadly speaking, this generation has seen three major developments in jam making—the artificial preparation of invert sugar for addition, as such, to jam; the use of fruit pulps preserved with sulphurous acid in place of fresh fruits; and the commercial preparation of pectin to aid in producing a "set" in jams and jellies.

Invert Sugar

Time was when the amount of invert sugar in a jam, on which depends its capacity to grain or, as the consumer puts it, "go sugary", was governed by the quantity of fruit acid present, and the length of the boil as determined by the steam or gas pressure. The skilled jam boiler could tell you, as the result of his many years experience, when he had obtained the optimum set having regard to cost, but not infrequently his jam would grain in the course of a few weeks. But now the use of the rapid-boiling steam-jacketed pan and the inclusion of invert sugar in the boil has removed this trouble to a very large extent, especially where the boils are checked by means of the refractometer.

Sulphited Pulps

While the use of invert sugar as a raw material of jam manufacture has been accepted as an advantage, the advent of sulphited fruit pulps was not received with such general favour.

The advantage of being able to "spread" jam manufacture over an almost unlimited period could not, of course, be gainsaid both from the maker's and the consumer's point of view. To the former it means normal factory hours and the division of labour and overhead charges over a longer period with more economical working; it means that capital has not to be tied up to the same extent in fruit, sugar and glass; while to the consumer it means reduced costs and therefore reduced prices. But it also means, in the estimation of many, a product which is inferior to the jam made from fresh fruit. It may be argued that even the skilled palate is hard put to it to distinguish between jams made from fresh and from sulphited fruit, but it must surely be conceded that from a dietetic point of view the fresh fruit jam wins.

Colour

Its competitor has generally to be coloured because the action of the sulphurous acid on soft fruits is to bleach out some, if not all, of the colour, and this does not return fully on boiling off the sulphur dioxide. Food colours are quite harmless, but they are in the nature of adulterants and as such are objectionable. In the U.S.A. the presence of sulphur dioxide in a jam is opposed by the Department of Agriculture, and, generally speaking, the American receives jam made from fresh fruit when he makes his purchase. In this country, however, there is no doubt that fruit pulp preserved in this manner has come to stay. It has, of course, led to abuses in some directions, although the use of pectin has been more guilty in this respect.

Pectin

Pectin, the substance in fruits which, in the presence of sugar and acid, produces a "set" in a properly prepared jam, is a variable factor. Some fruits are naturally rich in pectin; others are almost devoid of it, but in all fruits it reaches its maximum development when the fruit is fully grown, but the proportion diminishes during the ripening process. Also, after the fruit is picked and

Stainless steel jam boiling pans with "Fordyce" patent welded joint. (This and the other illustrations in this article are reproduced by courtesy of Wm. Brierley, Collier and Hartley, Ltd.)

begins to stale the pectin depreciates rapidly. This also applies to sulphited fruits, and frequently so to such an extent that a fruit which would normally produce an excellent jam when fresh will, when preserved with sulphurous acid, require the addition of citrus or apple pectin to give a good set. It will be seen, therefore, that the commercial uses of pectin and sulphited fruits tend to bolster one another.

The jam manufacturer has not been slow to take advantage of the improvement to be conferred upon certain classes of jam by the addition of an appropriate amount of pectinous material. It has long been known that strawberry jam, for instance, made from fruit and sugar only, will not produce an article of sufficient firmness for commercial use, and it was the practice to include a certain percentage of gooseberry juice with the object of obtaining a firm gel. This practice, which in no way detracted from the quality or flavour of the strawberry jam, has now given way to the use of pectin produced commercially from apples or from citrus fruits.

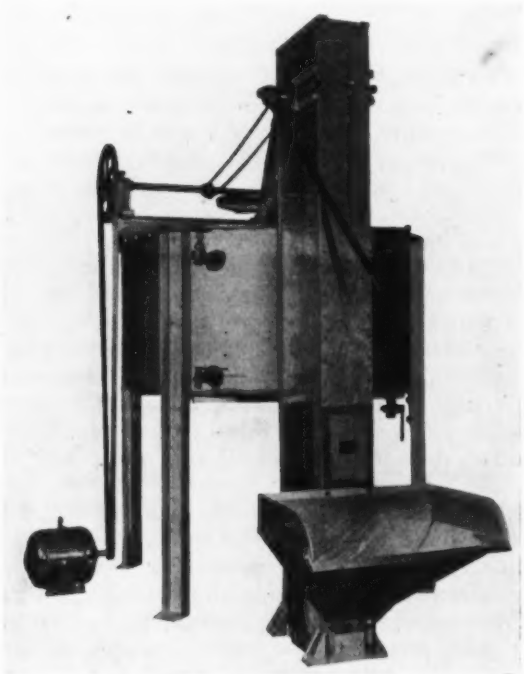
Undue Use of Pectin

This benefit conferred upon the trade was, however, quickly abused by certain small sections, for it was found that a considerable proportion of the fruit could be replaced by a small quantity of pectin without altering the consistency of the jam, and in the case of acid and strong flavoured fruits without markedly reducing the flavour. Also it was found that some of the fruit juice, such as raspberry and black currant, could be expressed and the remaining seeds and fibre fortified with pectin to make a jam. To add further to the confusion, there was no guarantee of the fruit content of any fruit pulp preserved with sulphur dioxide. It might contain 75 per cent. fruit or it might be half water, and the jam manufacturer was left to make his own calculations and adjustments as best he could.

Such methods not only brought jam into some disrepute, but those who abused the use of pectin were gaining an unfair advantage over the normal and accepted methods, both in profit making and in price cutting.

Standards Established

The outcome of all this was of course the standards laid down by the Food Manufacturers Federation, to which all accredited jam makers now subscribe, and according to which a definite percentage of fruit is guaranteed and the use of other fruit juice revealed. Unfortunately, if one may judge by the number of successful prosecutions this year for deficiency of fruit in jams of guaranteed standard, there are still those who are abusing the use of pectin by failing to incorporate in the jam the



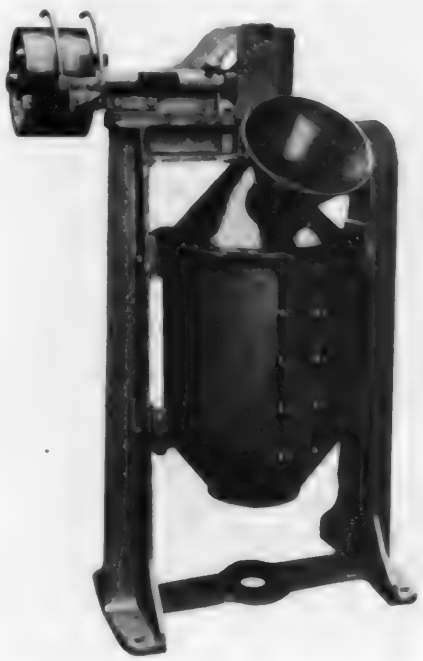
Sugar dissolving or melting vessel used for dissolving up to 2½ tons of sugar at a time.

amount of fruit which, according to the label, they claim to have used. The moral aspect of such cases is painfully clear to all who suffer from this form of unfair competition, for where there is deficiency in fruit in jam, price cutting almost inevitably follows. The fruit is the dearest ingredient, and even 4 lb. short weight in the boil can make a difference of several pence per dozen pounds of jam.

Variability of Fruit

The difficulty, however, is not to determine the fact that a jam may be underfruited, but to *prove* that such is actually the case and that such deficiency is therefore deliberate. The only means at present available are through the known average content of fibre, soluble solids not sugar, and free acids of the raw fruit; but since Nature is notably inconsistent in her gifts in this direction, the

average can be considerably higher than any given sample. Fruits vary enormously according to the district in which they are grown, the type of soil and the kind of weather. A dry Spring and a hot Summer will produce a quite different fruit from that grown in a wet Spring and cold Summer, and who is to say that even the lowest figures yet recorded may not be surpassed in any particular sample of fruit? The difficulty, therefore, of determining when a jam is below its stated standard would seem to be insoluble, but science has solved greater problems than this, and we hope the time may not be far distant when it will be possible to say with exactitude when such products are deficient in fruit.



A continuous chopping machine for oranges, apples, pomace, etc. Fitted with hopper feed, at top. Output of one ton per hour.

Dietetic Properties

In passing, some mention might be made of the dietetic value of cheap jams as compared with the full-fruited products. The invert sugar and the fruit acids especially are very valuable additions to any normal diet. They are easily assimilated and provide a ready and efficient source of health and energy for young and old alike. In cheap jams the fruit acids are deficient and the proportion of cane sugar—dietetically an unsuitable food—is greater, facts which should be better appreciated by the public.

Closures

Apart from the three main features named above, there have been minor changes of note in recent years, of which the closure of the jar may be mentioned as the most important. The parchment tie-over which was generally used was admirably suited to its work in everything except its resistance to damage. By its nature the paper cover maintained a state of equilibrium between the atmosphere outside and the air within the headspace of the jar. This "breathing" normally resulted in a certain drying of the surface of the jam, with the consequent rise in the soluble solids to the point where moulds could not grow. Circumstances could arise of course where, through the "weeping" of uncooked fruit, or a very damp atmosphere, the surface solids might be lowered to a point where mould growth ensued, but generally the reverse was the case.

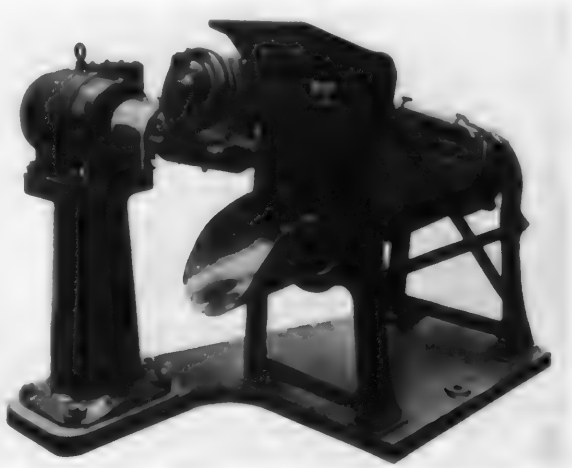
The Moulded Cap

The paper top was followed by the "press-on" moulded paper cap, which was equally successful in respect of keeping qualities and had the added advantage that it would resist any reasonable pressure. Among metal caps the plain press-on caused some trouble for a time owing to the condensation of vapour on the underside, with consequent lowering of the surface soluble solids locally, and the development of mould, but the difficulty was overcome by leaving a hole in the centre of the cap and using a parchment disc beneath. Of the many types of closures offered, however, the most suitable is probably the replaceable cap with wheeled or crimped on rim and rubber gasket. Not only does this cap resist damage and pilferage or the attack of vermin, but it is, when properly applied, proof against moulds and ferments. The jam when filled into jars hot is sterile, and if the cap is applied at once and then placed in a chamber where a jet of hot air or steam can impinge upon it, this too will be sterilised. Moreover, the partial vacuum which develops in the headspace of the jar, while not in itself inhibiting the growth of mould, indicates the security and sterility of the closure.

Tropical Fruit

Another development which has been noticed in recent years is the appearance of speciality lines and jams made from tropical fruits. Such newcomers add variety to the

(*Continued on page* 157.)



Direct coupled motor-driven stainless steel pumping or sieving machine.

SCIENTIFIC CONTROL

C. L. HINTON, F.I.C.

(Of the British Association for Research for Cocoa, Chocolate, Sugar Confectionery and Jam Trades)

ANALYTICAL CONTROL is essential in the manufacture of jams, marmalades and jellies if the products are to satisfy the requirements of the law and the manufacturer's own desire for uniformity and keeping quality. The methods available for this control are, however, somewhat scattered in the chemical literature, and it may be convenient to the jam chemist to assemble them here. At the same time it will be possible to deal with particular points which arise in their application to the materials and products of the jam factory.

Soluble Solids

Of the analytical determinations required for the purpose of control during manufacture, the determination of the percentage of soluble solids is of prime interest.

As a handy guide to this percentage the refractometer is a necessity, and readings can actually be made, if required, while boiling is in progress. The readings should not be relied on as giving the percentage of soluble solids with strict accuracy. These instruments are either graduated for pure sugar syrups, or are used in conjunction with tables of refractive indices of such syrups. Invert sugar, acids and other minor soluble constituents of the jams have not quite the same effect as sucrose on the refractive index, and the graduations and tables for sucrose do not strictly apply. Corrections for these constituents (chiefly the invert sugar) can be made,[1] as also for the effect of the undissolved matter such as fibre and seeds. But in practice it is better to ignore these corrections and fix a refractometer figure to work to for each type of jam, based on a trial boil to a desired output weight or on a more exact determination of the soluble solids by the specific gravity method. If the intention is simply to maintain the 68·5 per cent. minimum of the Jam Standards, then the refractometer is all that is called for, since this minimum is based on the refractometer reading without correction.

Refractometer Technique

A few precautions in the use of the refractometer may be mentioned. In dealing with samples straight from the pan the jam should be cooled well down towards the room temperature before placing it on the refractometer prisms, and sufficient should be taken so that evaporation cannot alter the reading appreciably. In all cases, efficient mixing of the sample is necessary, and if unbroken pieces of fruit are present, these should be well crushed, or the sample passed through a mincer. A convenient way is to squeeze a portion of the jam through a small piece of muslin on to the prism. This removes seeds, etc., which might damage the prisms.

Dark-coloured jams are sometimes troublesome, but the new type of "projection" refractometer, depending on total reflection of light within the prism at the surface of contact with the jam, is very useful in such cases.

For the determination of soluble solids by means of the specific gravity, a 20 per cent. solution of the jam is made by stirring 50 gm. in warm water until the jelly portion has dissolved. The solution is poured off from the fibre and seeds into a 250 c.c. volumetric flask, and the residue boiled two or three times with small quantities of water, which are then poured into the flask. The solution is cooled to room temperature, made to volume, mixed well, and filtered through a fine sieve or a coarse filter paper. The specific gravity of the filtrate at 20° C. is determined with a specific gravity bottle, and the percentage of soluble solids in the jam is given by the formula:

$$\frac{(\text{Sp. gr.} - 1{\cdot}0000) \times 1000}{3{\cdot}845} \times \frac{100}{20}.$$

Corrections for invert sugar and insoluble matter by this method are practically negligible.

The refractometer and the gravity methods are both quite useful in determining the approximate soluble solids content of fruit pulps when working out recipes or checking fruit content. In this case the strained pulp can be used directly for the specific gravity, and the term $\times \frac{100}{20}$ is omitted from the formula. Figures for the average percentage of soluble solids in jam fruits have been published.[2]

Invert Sugar

The most convenient method for routine determinations is undoubtedly titration with Fehling's solution by the Lane and Eynon procedure. For this, the 20 per cent. solution prepared as for the specific gravity is diluted to 2 per cent. concentration and titrated to 25 c.c. of mixed Fehling's solution, with methylene blue as internal indicator. Tables showing the amount of invert sugar corresponding to the titration figure have been published in convenient form, along with a description of the titration procedure.[3] Thus, the percentage in the sample can be readily calculated.

The Fehling's solution should be the usual Soxhlet modification containing 69·3 gm. of crystalline copper sulphate per litre of "blue" solution. A fresh mixture of "blue" and "white" solutions should be prepared every few days.

# of JAM

Sulphur Dioxide

This is an important determination where jams are made from sulphited pulp, as the limit of 40 parts per million for residual SO_2 in jams is a definite legal standard.

For most jams, with the important exception of black currant, the rapid method worked out by a committee of chemists in the jam and confectionery trades is satisfactory.[4] The SO_2 is rapidly boiled off from an acidified solution of the sample in previously boiled distilled water, and collected, by means of a condenser and bubbler, in a beaker of water, where it is titrated with iodine as it distils over. The whole process can be carried out in about 15 minutes. For acidification of the sample, concentrated hydrochloric acid is now used in place of phosphoric acid.

In the case of black currant jam, it is not possible by this rapid method to be sure of driving off all the SO_2, which is sometimes firmly held by the currants. For reliable determinations in this jam the method of Monier-Williams should be used.[5] The apparatus can be simplified somewhat by substituting a bubbler (such as is used in the rapid process) for the U-tubes of Monier-Williams, the bubbler standing in a narrow beaker containing the dilute hydrogen peroxide.

[F.M. Copyright

Determination of sulphur dioxide by the rapid process.

*p*H Value

Determination of the *p*H value of jams is becoming of increasing importance in the control of inversion and setting. The *p*H value of pulps also is a very useful guide in indicating the extent to which the SO_2 has become oxidised and hence likely to cause high inversion and other troubles.

The most convenient method of determining the *p*H value of these products is with the so-called "quinhydrone electrode", in conjunction with a saturated-KCl calomel half-cell. Various forms of potentiometer or slide-wire bridge are available for determining the E.M.F. generated. The formula for calculating the *p*H, if the readings are made at about 20° C., is as follows:

$$pH = \frac{454 - m}{58},$$

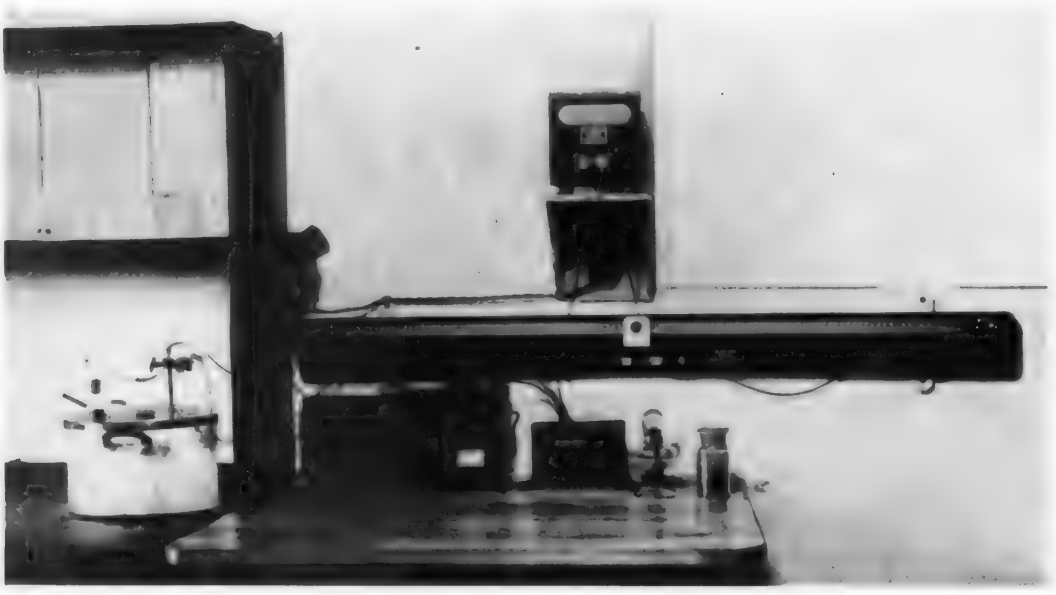
where *m* is the E.M.F. in millivolts. It is convenient to construct a table or graph from this formula so that the *p*H can be read off at a glance. The reading itself, once the solution is made, occupies but a minute or so.

In the case of jams or jellies, a roughly 50 per cent. solution of the sample in distilled water is used for the test. Pulps should be diluted with four times their volume of distilled water and the mixture rapidly boiled down to half its bulk to drive off most of the SO_2.

With some fresh fruit jams and marmalades there is a slight drift of the reading, probably due to the reducing action of some of the fruit constituents (possibly ascorbic acid) on the quinhydrone. In such cases the reading should be taken without delay—say within half a minute of mixing in the quinhydrone.

Copper

Contamination of jams, etc., with this metal is apt to occur when copper plant is used, unless great care is taken. A check on the copper content of the output is desirable occasionally, and is not a difficult matter in this class of product. The sample should be ashed in a platinum or silica dish at a dull red heat only. The ash is digested with a few c.c. of hot concentrated hydrochloric acid, which is then diluted, filtered and washed through with hot water. After passing H_2S for about 10 minutes, the solution is left to stand overnight. The sulphide precipitate is filtered off through a small filter and washed rapidly twice with cold H_2S solution. (If the filtrate is at first cloudy it should be poured back until it comes through clear.) The filter containing the sulphides is ashed at a gentle heat, the ash dissolved in 3 c.c. of hot concentrated HCl, and the solution diluted to 100 c.c. Half of this is taken in a Nessler cylinder and 3 c.c. of concentrated HCl added, followed by 5 c.c. of fresh saturated H_2S solution. The colour obtained is compared against standards prepared from known amounts of copper sulphate solution, treated with HCl and H_2S solution in the same way. If the colour is deeper than that formed with 0·15 mgm. of copper in the standard, the test should be repeated on a smaller portion



[F.M. Copyright.

Apparatus for the determination of *p*H values.

of the remaining test solution. Blank tests should be carried out with the acid and filter papers used, and any copper so found allowed for.

Insoluble Matter

We come now to the analytical determinations that are required if estimation of the fruit content is called for. Of these, the determination of insoluble matter will be first described, although this has undoubtedly been too much relied on in the past, especially in official circles where conclusions have to be based on the analysis of a single jar of jam.

For the determination, 20 gm. of the well-mixed or minced-up jam are boiled with about 100 c.c. of distilled water for half an hour, and the mixture poured on a dried, weighed filter paper. The fibre, etc., is washed back into the beaker and boiled for 15 minutes with more water, again filtered, and the washing back and boiling repeated. Finally, the insoluble matter is washed on the filter with plenty of boiling water and dried in the oven at about 100° C. to constant weight.

The insoluble matter of fruit pulps may be determined in a similar way. Published data for the insoluble matter in jam fruits[2] enable the fruit content to be roughly calculated. It should be noted that Scotch raspberries have lower percentages of insoluble than others.[6]

Pectin

A determination of this substance is sometimes required, and is best carried out on the washings from the determination of the insoluble matter, by the calcium pectate method of Carré and Haynes.[7]

Acidity and Lead Number

The soluble constituents of the fruit are much more evenly distributed throughout a batch of jam than is the insoluble matter. For this reason they give a more reliable indication of the amount of fruit present; and, moreover, can do so in the case of jellies also. It is unfortunate that in many cases official analysts have paid too little attention to these soluble constituents in analysing legal samples, although the advantage mentioned is important where only one jar, which may have been badly filled, is available.

Of these soluble constituents the acids are the best-defined chemically, but their use as a means of discovering the fruit content is complicated by the fact that the commercial pectin preparations frequently added are themselves acid to some extent. Hence a simple determination of the acidity alone usually cannot give an accurate measure of the fruit content.

As it happens, the acids of these commercial pectins are generally malic and lactic, whereas that of several of the chief jam fruits (strawberry, raspberry, black and red currants) is chiefly citric, or in other cases (apricot, blackberry, gooseberry) partly so. Thus, a method of determining the acid constituents which distinguishes the citric from the malic and lactic acids can give a useful indication of the amount of fruit.

The most convenient method so far proposed for this purpose is one which depends on the differences in solubility of the lead salts under certain conditions.[8] The method was the outcome of observations by the late L. K. Boseley that the jam fruits precipitated relatively much more lead from solution than did apple juice or pomace extract. An outline of the method can be given here, but for details, which must be closely followed, the original paper should be consulted.

A solution of the jam is prepared and freed from pectin by addition of an equal volume of acetone. The free acidity of this de-pectinised solution is titrated by means of sodium hydroxide and phenolphthalein; and the amount of combined fruit acid is found from the alkalinity of the ash. The two together give the total fruit acids.

[F.M. Copyright.

Determination of invert sugar in Jams, etc.

From a portion of the solution the acetone is boiled off, excess of lead acetate solution is added, and the precipitate of lead salts is filtered off. A titration of the excess of lead in the filtrate then shows the amount of lead precipitated. A second determination is made after adding the lead acetate to the jam solution in presence of 50 per cent. of acetone. The amounts of lead thus precipitated are recorded as "lead numbers". The second lead number is a measure of all the citric and malic acids in the sample, while the first is due to the citric and only a definite fraction of the malic. Any lactic acid present is not precipitated in either case. From data for the lead numbers of the various fruits, and also for commercial pectins, the proportion of the acidity of the jam due to the fruit in question can be arrived at; and hence, from the average acid content of the fruit, the percentage of fruit in the jam is found.

A difficulty sometimes causing trouble is a poor end-point in the titration of the excess lead with ammonium molybdate. The difficulty can usually be overcome by making a rough titration first, and then a second in which nearly the requisite amount of molybdate is added (say 0·5 c.c. less than the rough titration). The mixture is then boiled, filtered and washed through well, and the titration completed in the usual way.

The lead method, of course, is not available where the principal acid of the fruit is malic (chiefly stone fruits).

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[2] *Analyst*, 1931, **56**, 35.
[3] Norman Rodger, 7 and 8, Idol Lane, London, E.C. 3.
[4] *Analyst*, 1928, **53**, 118.
[5] *Analyst*, 1927, **52**, 415.
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Chemistry Congress *sans* Politics

AMID the present turmoil and strife which characterise the world to-day, alienating nations and widening gulfs which should never exist, an international conference of science comes as a sudden realisation that there are still things in this world that pursue their way peacefully and with a disregard for politics. The Tenth International Congress of Chemistry will take place in Rome from May 15 to 21 next.

Professor N. Parravano, the President of the Union Internationale, is the President of the Congress, and he and his many Italian colleagues express the most sincere wish for the attendance of British visitors and assure them that their organisation will do all that is possible to make the stay in Italy most agreeable. That the Italian chemists can do this is obvious; those who some years ago attended the great meeting in Sicily will well remember how perfectly that meeting was organised, what wonderful scenery was enjoyed, what great historical associations Sicily and Italy possess, and how charming and delightful the Italian chemists are.

The Congress will be divided into eleven sections, and Section IV, which deals with chemistry and alimentation, nutrition, analysis and the foodstuff industries, will be of most interest to our readers. Of this section Dr. Lampitt, the well-known research director of J. Lyons and Co., Ltd., is the Chairman.

Jam Manufacture Today
(Continued from page 153)

purchaser's choice and weld the jam habit more securely to the English tea and breakfast tables, and while such products will never replace such old favourites as strawberry and black currant, they do help to draw the public's attention to the claims of jam as a whole. There are so many claims upon a buyer's attention in these days, in the form of canned and bottled delectables, that a novelty in the jam world is to be welcomed.

The same may not, perhaps, be said about Australian canned jams which have been arriving here in considerable quantities during the past few years. These, with the exception of apricot and peach, are definite competitors of the home-produced article. Nor are they subject to any guarantee as to fruit content.

Competition is a matter which has exercised the trade for some time now, but we are persuaded that the future still holds bright prospects.

Correction

ON page 136, column 1, line 2 of Mr. Brayham's article published last month, the word, "Fig. 9" should, of course, have been "Fig. 11".

APPLE JUICE

These tins are made by the Metal Box Co., Ltd., which has also rendered great service to the industry by research in its laboratories.

AMAZING ADVANCES have taken place during the last five years in the technique of production of natural fruit juices. Partly as a result of the drive towards the ideal of providing fresh fruit, either in a whole or liquid condition, throughout the whole year as an essential plank in campaigns for national fitness, and partly encouraged by economic factors, the natural fruit juice industry is now thoroughly established in several countries.

In America the consumption figures for tomato, citrus and unfermented grape juices have reached very high levels, and on the Continent of Europe the development of the natural fruit juice industry has been almost spectacular, especially during the last five years. In the latter case this development has been most marked in connection with grape and apple juices.

In Germany the greatest encouragement has been given to this development by the Government in conjunction with the medical profession, dietitians, health authorities and athletic associations, who believe that national efficiency is largely dependent on providing the people with the vitamins, minerals and other nutritive properties contained in fruit juice. Experimental evidence is available to show that fermentation destroys four-fifths of the value of fruit juice from the nutritional point of view. In Germany the consumption of apple and grape juices has reached a very high figure, while in Switzerland the consumption per head of population exceeds that of Germany.

It is stated by certain well-known Continental authorities that fruit juice is necessary as a complement to milk in a proper diet, particularly that of children.

A New Company

Being impressed by the rapid advances made on the Continent, a new company was formed in this country in May, 1937, and acquired a very fine range of factory premises at Wisbech, which were admirably suited for conversion for the installation of a plant for the manufacture of apple juice. The directors made a very careful investigation of the various processes employed in Continental factories, and in this connection visited a large number of plants in both Germany and Switzerland. This enabled them to form a proper idea of the most suitable and up-to-date plant required. This wise plan of taking advantage of other people's experience cut out the experimental period which ofttimes accompanies the inception of a new business.

By one of the caprices of fate, or whatever determines these things, the apple crop of 1937 was one of the worst on record. This, however, did not deter the promoters of the enterprise, who secured supplies from Kent, the West Country and Ireland.

The Directors.—Mr. C. C. Kline, of Bedford, is Chairman of the Company, and among others on the Board are Mr. F. J. Smith, who has had considerable experience in the manufacture of fruit syrups, Mr. F. F. Parsons, a well-known food manufacturer in the Midlands, Capt. J. W. Parkins, Sales Manager, and Mr. W. R. Ramsay, B.A.

Juice Production

The chief considerations are that the apples should be properly matured in order that a high quality juice should be obtained. Apples which are unsuitable for market, being either small or misshapen, are quite satisfactory, provided they are sound. In the production of apple juice the outlet which is created for this type of apple will be of considerable assistance to the fruit growers throughout the country.

Sorting

The first process of manufacture is the sorting of the apples. This is carried out on a travelling sorting table, from which all bad and diseased specimens are eliminated. They are then thoroughly washed and carried, by means of a bucket elevator, into the mill, which is in the adjoining room. This washing process not only removes dirt but eliminates many of the yeasts which are present on the skins of the apple, so preventing one source of fermentation infection.

Milling

The apples are then milled and made up into a cheese in the usual manner in press cloths. The cheese is built up on a turntable, which can be revolved to the hydraulic

FROM WISBECH

Specially Contributed

The washing tank and elevator at the Wisbech factory.

press, forcing the juice from the pulped apple, which is drained off by gravity feed, and is then pumped into large settling vats.

Centrifugalisation

After clarification the juice is centrifuged, impregnated with CO_2, and pumped into large tanks, where it is held under a pressure of eight atmospheres of CO_2. There are at present six of these tanks, but the building as it now stands is capable of rapid development, and it is estimated that there is accommodation for the storage of half a million gallons.

Maturation

After storage the juice is subject to a period of maturation, which enhances the flavour, and on completion of this period it is drawn out of the tanks, through the separator, which de-gases the juice, which is then subjected to a process of filtration which renders it crystal clear, ready for filling. The process of filling is carried out in the usual manner under the strictest conditions of cleanliness.

Yields

The yield of juice per ton of apples is approximately 160 gallons per ton from a single pressing. In some cases it is usual to re-press the cakes, but this is not being done in the Wisbech factory, as it is considered to have certain disadvantages.

The residue in the form of apple pomace is dried and sold for the manufacture of pectin and various other purposes. Wet pomace can also be sold for cattle feed at approximately £1 per ton.

Clarification

In order to ensure that solids in solution do not come down in the bottle a special process of clarification has to be carried out. In this connection the company are using a special process of their own, but in many factories this is carried out by the introduction of an enzyme in the form of Pectagol or Filtragol in the settling tanks.

The separator in use is a special machine designed for apple juice and is very satisfactory for the removal of solids from the raw juice.

Unpacking the pulped apple after extracting the juice.

Above, the juice is being separated, impregnated with CO_2 and pumped into tanks. High pressure tanks are behind.

The final filtration is carried out by a special type of pulp filter, and in this connection the greatest care has to be taken to ensure that every part of the equipment is sterile and clean.

Storage

The method of storage is the "Seitz-Boehi" method, which is considered to be the most satisfactory, as this enables the various types of juices to be blended in order to ensure that a standard flavour can be supplied throughout the season.

Sterilisation

This is secured by final pasteurisation in the bottles at temperatures which have been proved to give satisfactory results in the commercial manufacture. The greatest care has to be exercised at this point in order to ensure that stability and the nutritive values of the juice are retained, and a special process is used to ensure that no cooked flavour is imparted to the juice as a result.

It is claimed that pasteurisation also inactivates the oxidase enzymes without affecting the flavour of the juice.

Suppliers of plant to Orchard Products (Wisbech) Limited:

Cans: *Metal Box Co., Ltd.*
Bottles: *C. Squires and Sons, Albion Works, Howard Road, N. 16.*
Aluminium Sealing Caps: *Alka, Ltd., North Acton.*
Alfa-Laval Separator: Specially designed for process.
Labels: *Balding and Mansell, Park Works, Wisbech.*
Fiberite Containers: *Thames Board Mills.*
Detergent for Bottle Washing: *Bottling Trades Chemical Co., Ltd., Great West Road, Brentford.*
Carbon Dioxide: *The Carbon Dioxide Co., Ltd., Hedon, Hull.*
Wire Strapping for Cases: *A. Power and Co., Birmingham.*
Vats: *Roberts of Tottenham High Street.*
Filtering Plant: *Geo. Clayton.*
Press: *Ingleheimer Maschinenfabrik.*
Electric Motors: *The Stamford Electric Co., Ltd., Stamford.*
Steam Boiler: *Dodman and Son, King's Lynn.*
Labelling Machinery for Bottles: *Binnington of Hull.*
Impregnating Pump, Emaillit High Pressure Tanks: *John C. Carlson.*

On the left is a view of the storage room, showing six high-pressure tanks. From left to right, impregnating plant, high pressure separator and filter.

The last process of all, but quite as important as the others, is the bottling of the finished apple juice. The view on the left is of the bottling plant.

FOOD POISONING

Elliot B. Dewberry, M.R.I.P.H., M.R.San.I.

Part III, Metal Poisoning

ACUTE POISONING from the presence of copper salts in food seems to have been but rarely demonstrated, and there is no doubt that the toxicity of the metal has at times been much exaggerated. It appears to be difficult to detect ill-effects when copper is fed to experimental animals, and rats fed over a long period with food containing salts of the metal show no sign of chronic poisoning. The opinion has been put forward, however, that such experiments do not do away with the possibility of the metal having an irritating effect on certain organs of the human subject, as is known to be produced by retention of other heavy metals in the body. From some feeding experiments on healthy men copper was found to be retained in the liver, and it is inferred that such retention of the metal must be harmful.

Excessive amounts of copper in food would probably be avoided, as, for instance, its presence in condensed milk gives it a tallowy flavour and in ordinary milk an emery taste. At one period salts of copper were added to foods, vegetables and condiments to improve the colour, but this objectionable and perhaps harmful addition is now forbidden by the Public Health (Preservatives, etc., in Food) Regulations, 1925, but it is, however, still practised on the Continent, and in 1934 four samples of canned mixed vegetables imported from Belgium were found to contain on analysis 36 to 54 parts of copper per million. In the same year copper was found present in tomato purée to the extent of 15 to 40 parts per million of copper, due to preparation in copper vessels. This article is widely used in food canning and the production of sauces.

The amount of copper and other metals occurring naturally in foods is adequate to maintain the ionic equilibrium of these elements necessary for their proper biological functioning. Clayton compiled the following table, showing the natural copper content of foods in parts per million:

Eggs ..	1·1-1·19	Beef liver	16·0
White potatoes ..	6·5	Beef kidney ..	2·4
Yellow potatoes ..	4·1	Beef tongue ..	1·2
Black grapes ..	8·1	Cow milk ..	0·5-0·85
Navy beans ..	10·45	Human milk	0·5-0·6
Lima beans ..	8·6	Butter ..	av. 0·6
Yellow corn ..	16·6	Cheese	0·6

Grendel in 1930 estimated that the daily diet of a child of six to twelve years old would contain 0·5 to 1·0 mgrm. of copper and of an adult 2·10 mgrm.

The presence of copper salts in oysters is well known, especially those obtained from the Cornish beds, but a considerable number would have to be eaten to yield a poisonous dose of the metal. A few cases of poisoning supposed to have been caused by food cooked in copper vessels have been reported. Hebblewhite in 1928 described an outbreak of illness which was traced to the use of large copper kettles for heating water, which were used in the preparation of foods. Another outbreak was reported by Gardner in 1925 and was caused by copper salts in bread which became contaminated by the copper machinery used in baking. The tendency in modern food factories and other places where food is prepared is to replace copper equipment by other metals such as nickel, monel and stainless steel and even silver, particularly as copper is readily dissolved by acid or salted foods.

Copper sulphate has been used on occasions for preventing the growth of objectionable algæ in water supplies. Fowler (1905) stated that 2 pints of such water would contain $\frac{1}{4}$ grain copper. The dose of copper as an astringent is $\frac{1}{2}$ to 2 grains. He believed that such water was harmless to consumers. Copper pipes are now in common use for the conveyance of water supplies in buildings.

Lead

This metal is a familiar and dangerous poison, and if taken into the human body over a long period accumulates in the tissues, often resulting in chronic illness.

The bones of apparently normal individuals contain lead to the extent of 100 parts per million, and it is excreted in the urine in minute quantities, the average being 0·05 part per million. The British Pharmacopœia (1932) gives the dose of lead acetate as $\frac{1}{4}$ to 2 grains, equivalent to 0·3 to 1·1 grains of the metal.

Lead is present in natural foods and appreciable amounts have been found in marine crustaceans. It occurs to a considerable extent in articles brought into close association with food, lead apparatus and the solder of cans being a means of introducing the metal into food. The metal is attacked by acids and alkaline foods and beverages, and many instances of poisoning have been recorded as a result of such contamination, both in this country and abroad.

In small quantities lead may gain access to foil-wrapped articles such as cheese and confectionery, but

the use of paper interliners prevents contact between the food and the foil. Beer and cider are known to take up the metal from vessels and pipes, and in 1922 ninety-three cases, with one death, occurred in the county of Middlesex from the consumption of beer which had dissolved a substantial proportion of lead (up to 1·9 grains per million) from the enamel linings of the tanks in which it was stored. Recently an outbreak of lead colic was reported from Devonshire. This was traced to cider drawn through tin-washed lead pipes connected to the casks and counter engines; lead being present to the extent of 1/10 to 1/20 grain per gallon.

A curious epidemic of 37 cases of lead poisoning occurred in 1925, and was traced to bread baked in an oven heated by wood derived from the breaking up of old boats, the wood being impregnated with paint containing lead salts.

The investigations and experiments carried out by Monier-Williams for the Ministry of Health on the cheap grade of glazed cooking vessels imported from France showed that considerable contamination may result from the use of certain foods. He stated, however, that "*the probability that undesirable constituents in insignificant amounts may be dissolved from enamelled hollow-ware during the ordinary process of cooking may be regarded as remote*". Cooking utensils now manufactured in this country have a leadless glaze.

Imported Sardines

Trouble has been experienced of late with imported sardines, these being found contaminated with lead. During 1925 fifty-five consignments were analysed with an average of 11·7 parts per million. The Medical Officer of the Port of London states that the highest figure in the Port of London was 78 parts of lead per million, and amounts over 20 parts per million were not infrequent in Portuguese sardines. It is believed that contamination is derived from the grills (iron wire coated with solder containing a high proportion of lead) in which the Portuguese steam the fish. Twenty-five consignments representing 250,000 tins of sardines were rejected in the Port of London. He also records that lead was found in smaller quantities in a number of other canned products—for example, tunny fish, 13 parts per million; *pâté-de-foie gras*, 10 parts per million; anchovies, 8 parts per million; peeled shrimps, 7 parts per million; crab paste, 6 parts per million. It might be observed regarding the amount of lead in sardines, a limit of 20 parts per million was suggested at the Conference of the Port Medical Officers in 1933. Dr. White also stated that "Merchants have argued that the amount of lead in sardines is not dangerous to health and have told me how many tins of sardines they have eaten, but when it is pointed out to them that lead is an accumulative poison, that much damage may be done before definite symptoms of poisoning can be diagnosed, and that the trouble is not just the quantity ingested in sardines but the many small doses from the many different sources, they see our point of view and are anxious to know what steps can be taken to eliminate lead from their products".

In the Annual Report of the Chief Medical Officer of the Ministry of Health for the year 1935, attention is drawn to the importance of tea in lead-lined chests, and analyses of tea taken from these chests in this country and America have shown that considerable amounts of lead may get into the dry tea—usual amounts 10 to 20 parts per million—and experiments have shown that about one-third of this lead goes into solution or suspension in the tea infusion as consumed. The amount of lead in tea can be greatly reduced by using stout paper liners, but a still better way would seem to be the use of aluminium linings.

Aluminium

Probably no metal has caused so much controversy as the question of the toxicity of aluminium and its salts. While the extensive investigations and experiments carried out from time to time by numerous observers, to ascertain the amount of contamination of foods cooked in aluminium vessels and their effect on the human system, have frequently given negative results, nevertheless, statements continue to appear questioning the wholesomeness of repeated ingestion of this metal and its salts. The issue is raised again and again by those opposed to its use, and in consequence the literature on the subject has become voluminous.

Plagge and Lebbin (1893) conducted experiments in their laboratory, and for one and a half years the midday meal, which consisted of coffee and vegetables, was prepared and cooked for two men in aluminium vessels. No metallic taste was noticed, the vessels proving satisfactory. The two men put on weight and remained in good health. The observers concluded that aluminium plates are attacked by most foods but the amount of the metal taken by a person in a day is only a few milligrams. In 1913 the *Lancet* published the results of some investigations upon the effects of cooking foods in aluminium vessels. The experiments were carried out under conditions similar to those found in ordinary kitchens. Various foods and beverages were cooked in the aluminium vessels and the amount of the metal found in the food estimated and the effect upon the utensils studied. The report concluded as follows: "We are confident that aluminium, as it is now made by reputable manufacturers, is a suitable material for cooking vessels, and that any suspicion that it may communicate poisonous qualities to food in the process of cooking may safely be dismissed in view of the results of the practical experiments which we have recorded, showing that the metal is not appreciably acted upon in cooking operations. This finding is satisfactory also, inasmuch as aluminium is an excellent heat conductor; cooking in aluminium vessels is, therefore, rapid, and fuel is economised in consequence. But the management of aluminium cooking utensils requires the same ordinary applications of common sense as are customary in case of other metals employed for a similar purpose."

Thicone demonstrated by tests on experimental animals the suitability of pure aluminium vessels for culinary purposes. His experiments extended over several months and he concluded that abnormally large doses of aluminium salts are devoid of deleterious physiological

[*Courtesy, Liverpool Co-operative Society, Ltd.*

Using a bread wrapping machine in the prevention of the contamination of bread.

action. Other observers also confirm the non-toxicity of aluminium in food.

Monier-Williams, in a special report to the Ministry of Health on Aluminium in Food (1935), remarks that much of the experimental work which has been carried out to ascertain whether aluminium in food is harmful or not is conflicting, and in conclusion he says: "Aluminium salts, in doses which are not unreasonably high, have been shown to be not without action on digestive processes. It is a safe rule to exclude from food as far as possible anything that may reasonably come under suspicion of causing harm, and on this account it is undesirable to admit aluminium in the relatively large amounts in which it may be employed as a constituent of baking powders or self-raising flour. ***There is, however, no convincing evidence that aluminium in amounts in which it is likely to be consumed as a result of using aluminium utensils has a harmful effect upon the ordinary consumer.*** It is possible that there may be individuals who are susceptible to even such small doses of aluminium as may be derived from aluminium vessels, but evidence of this is not conclusive."

With reference to the addition of alum to flour for the purpose of arresting fermentation and renovating flour damaged by damp storage, this was forbidden by the Bread Acts of 1882 and 1886.

Under the sale of the Food and Drugs Act of 1875 several prosecutions took place as a result of using sodium aluminium sulphate—commercial baking powder—on the grounds that it caused gastric troubles. As a result phosphate powders took the place of alum baking powders, but attempts have been made to revive the trade of alum baking powders. Investigations on experimental animals, however, have shown that such baking powder interferes with growth and with the reproductive functions.

During recent years the use of aluminium vessels in food factories has increased, especially in Norway, where cans made of the metal are in prominence, especially for fish products which are neither too acid nor too salted. The cans are lighter, do not blacken when used for canning crustaceans and molluscs, etc., and no lacquer is required.

Tin

The wide use of tinplate for the construction of receptacles for the preparation, storage and canning of foodstuffs and tinfoil for the wrapping of perishable articles makes the question of contamination from these sources of considerable interest to food manufacturers. Chemical changes take place between fruit juices when heated in the presence of tin, and the metal is especially taken up by foods containing acids, such as meat extracts, vegetables and fruits, including peaches, pears, apricots, pineapples, asparagus and tomatoes. Also for some reason or other sardines, silds, herrings and similar fish canned in oil or tomato sauce are particularly prone to attack the surface of tinplate, and 2 to 8 grains to the pound have been found present. In some cases the containers were almost completely de-tinned, the fish actually sticking to the inside of the can. The formation of sulphides of iron and tin from the sulphur in certain

foods sometimes forms a bluish sheen or marbled appearance on the tin. No corrosion is indicated and, in fact, a film of such sulphide seems to confer protection during storage against acid juices.

There seems to exist a considerable difference of opinion regarding the toxicity of tin, and apparently there is no reliable data that the metal is harmful; most of the investigations on the subject seem inclined to the view that tin does not ordinarily affect the human system. It is generally agreed that foods consumed within a few months of canning may contain as much as ½ grain of tin to the pound, but this does not ordinarily cause gastro-intestinal irritation in the amount usually taken at a single meal. Savage, however, says: "Tin may exert a toxic action in two definite ways. The amount taken into the body with the food may be so considerable that a single dose may set up acute symptoms or chronic poisoning may be induced by much smaller quantities taken over a long period."

Buchanan and Schryver, in a report to the Local Government Board in 1908, stated: "It seems clear that, in any kind of canned foods, quantities of tin approximating to 2 grains to the pound are not only unusual and unnecessary, but also must be regarded with grave suspicion in consequence of the risk of irritant action of the tin they contain." Buchanan also drew attention to the desirability from an administrative point of view of requiring the date and place of preparation to be shown on the labels or to be otherwise available when required.

The Chief Medical Officer of the Ministry of Health, referring to the foregoing expression of opinion, remarks: "It would seem that this recommendation is amply justified and that anything in excess of this limit is not only evidence of bad practice in canning or storage goods, but is also undesirable on grounds of health."

Considerable apprehension exists in the minds of many concerning the presence of metals in foods wrapped in foil, although this protects the food from bacteria and dirt. In 1929 the Ministry of Health drew attention to the increasing practice of wrapping foods, such as soft cheeses, confectionery, etc., in tin foil and to the possibility that, in some cases, excessive amounts of tin may be taken up by food. It was suggested that manufacturers should give their attention to the matter with a view to substituting grease-proof paper or similar material for tinfoil. The annual report of the Ministry of Health, 1931-1932, states that foil-wrapped cheeses were found to contain tin up to 7 grains per pound.

There are no standards laid down for metallic impurities in wrappers, and the matter is a difficult one to decide. It has been suggested that probably the best method for fixing limits is to consider the area of the paper used, rather than the weight, correlating this as far as possible with the amount of foodstuff and the exposed surface of this also.

Zinc

There is apparently little evidence that the continued ingestion of small amounts of this metal has any deleterious effect on man, and despite the fact that outbreaks of food poisoning are now and then attributed to the contamination of foodstuffs by the metal, experiments on the question have usually not confirmed these toxic properties.

The use of galvanised vessels in modern food factories is practically unknown, but vessels lined with zinc are often used for the storage of foods. Acid foods are able to dissolve considerable amounts of the metal from galvanised vessels, and investigations made in 1924 on the effects of various liquids on such vessels is shown in the following table:

	Zinc as Parts per Million.	
	After 17 Hours Contact.	*41 Hours Contact.*
Tap water	5	21
Distilled water ..	9	27
Carbonated water ..	193	181
Milk	438	1,054
Orangeade	530	854
Lemonade	1,411	2,700

(After Sale and Badger.)

Poisoning by zinc and its salts is not unknown and occasional outbreaks have been recorded, one of which occurred in Surrey in 1922. Two hundred persons were served with apples which had been stewed in galvanised iron pans, and all suffered from dizziness, vomiting, colic and diarrhœa. The illness only lasted a few hours and all recovered. It was estimated that each person consumed zinc equal to about 20 grains of sulphate of zinc.

With regard to foods wrapped in zinc foil, Fairall and Walker of the United States, after examining a large number of these, stated that the amount of metal taken up was very slight and the normal degree of contamination constituted a negligible factor in the daily intake of zinc.

National Mark Schemes for Cheese

THE Minister of Agriculture and Fisheries has given notice of his intention to make regulations which will have the effect of amending the Agricultural Produce (Grading and Marking) (Leicester Cheese) Regulations, 1936, and the Agricultural Produce (Grading and Marking) (Wensleydale Cheese) Regulations, 1936. Under the revised regulations small Leicester cheese ranging from 16 lb. to 20 lb. in weight and small Wensleydale cheese of 1 lb. and 2 lb. in weight will be brought within the scope of the respective schemes. Under the new Wensleydale regulations cheese of 1 lb. or 2 lb. in weight may be graded at the minimum age of five days, while cheese over 2 lb. in weight will continue to be gradable at the minimum age of fourteen days.

Copies of the drafts of these regulations are obtainable (price 1d. each exclusive of postage) from H.M. Stationery Office at Adastral House, Kingsway, London, W.C.2.; or through any bookseller.

NEW REGULATIONS FOR FOOD FACTORIES

T. J. Sophian

The new Factories Act comes into force next July 1. The changes it will bring about in the existing regulations will considerably affect food manufacturers. Here, for easy reference, is an outline of the principal amendments, with especial regard to the food industry.

A NUMBER of important amendments of the law have been effected by the Factories Act, 1937, which was passed at the close of last session and which will come into force on July 1, 1938.

The Act consists of 160 Sections divided into 14 Parts and 4 Schedules, and having regard to the new obligations imposed on owners and occupiers of factories, a number of new offences are created (see S. 130 of the Act).

Moreover, district councils will be concerned in particular with the enforcement *inter alia* of the new obligations imposed by Part I of the Act, in particular in relation to securing the health of factory workers.

Our object in the present article will be to summarise as briefly as possible the chief changes in the law which will be brought about by the Factories Act, 1937.

General Provisions as to Health

Part I of the Act imposes a number of new requirements in the interests of the health of factory workers.

The enforcement of the provisions of this Part of the Act relating to sanitary conveniences, both as regards factories and workshops, and the enforcement of the provisions relating to cleanliness, overcrowding, temperature, ventilation and drainage of floors, but only as regards workshops (*i.e.*, factories not using mechanical power) are left to district councils (see S. 8). District councils, moreover, are required by S. 8 (3) to keep a register of all factories situate within their districts with respect to which the duty of enforcing any of the above statutory provisions is imposed upon them.

It may incidentally be noted in passing that the Act abolishes the distinctions between textile and non-textile factories and between factories and workshops (see definition of "factory" in S. 151).

Let us examine briefly the amendments contained in Part I:

Cleanliness.—With a view to cleanliness, every factory must be kept clean and free from effluvia arising from drains, etc. In particular accumulations of dirt and refuse must be removed daily and the floors of every workroom must be cleaned at least once a week, and all inside walls and partitions, and all ceilings, and all walls, sides and top of passages and staircases must be washed down and cleaned at least once in every fourteen months [S. 1 (1) (*a*), (*b*), (*c*), (*i*)].

Overcrowding.—To prevent overcrowding (see S. 2) the cubic feet space per person in every workroom is to be increased from 250 to 400. In the case of rooms being used as workrooms at the date of the passing of the Act (July 30, 1937), this new requirement will not apply for the next 5 years provided that *inter alia* the inspector does not in the meantime require the provision of effective and suitable mechanical ventilation. Freedom from the new restrictions as to cubic feet space may also be enjoyed for a further period of 5 years provided that effective and suitable mechanical ventilation is in any case provided in the workroom.

Temperature.—In workrooms where the occupation is sedentary and does not involve serious physical effort, a temperature of at least 60° must be maintained after the first hour, and each room must be provided with a thermometer fixed in a suitable place.

Ventilation.—The adequate ventilation of every workroom must be maintained in future *by the circulation of fresh air* therein (S. 4). Procuring ventilation by other means will not be sufficient.

Lighting.—Sufficient and suitable lighting whether by natural or artificial means must be maintained in all parts of the factory, whether persons are working or are only passing there (S. 5).

All glazed windows and skylights must be kept clean on both sides and must not be obstructed [S. 5 (4)].

Sanitary Conveniences.—In future the Factories Act provisions with regard to sanitary conveniences will apply as to all factories throughout the country, and there will no longer be the cleavage of functions in this respect between local authorities administering the Public Health Acts provisions in some parts of the country and the factory inspector enforcing the Factory Act provisions in other parts. The enforcement of the sanitary conveniences provisions will be in the future, moreover, solely in the hands of the local authorities (*i.e.*, the district councils [S. 8 (1)].

There must be an adequate provision of sanitary conveniences in every factory, and separate conveniences must be provided for the different sexes.

It is to be noted that under S. 7 (2) the provision of separate accommodation for the sexes is not required in factories where the persons employed are all members of the same family.

The powers of an inspector in relation to taking steps to secure the observance of the sanitary requirements of the Act in cases where a district council makes default are also to be noted (Ss. 9, 10).

General Safety Provisions

A number of new obligations are imposed with the object of securing the safety of factory workers. Non-observance of any such obligation will constitute an offence and will make the offender liable to summary proceedings.

In S. 15 of the Act there is an important provision which

prohibits the examination, lubrication or other operation of unfenced machinery except by male persons over 18 years of age.

There are new requirements as to the construction and maintenance of dangerous machinery (S. 16), as to the construction and sale of new machinery (S. 17), as to vessels, sumps or pits containing dangerous liquids (S. 18), as to the prohibition of the cleaning of prime movers or transmission machinery while in motion by women and young persons (S. 20), as to the proper training and instruction of young persons in the handling of dangerous machinery (S. 21), as to hoists and lifts (S. 22), chains, ropes and lifting tackle (S. 23), cranes and other lifting machines (S. 24), as to the proper construction and maintenance of floors, passages and stairs (S. 25), as to the provision of safe means of access to the place of work and the rendering safe of lofty places of work (S. 26), as to the taking of precautions in places where dangerous fumes are liable to be present (S. 27), as to the taking of precautions with regard to explosive or inflammable dust, gas, vapour or substance (S. 28), as to the rendering safe of steam boilers (S. 29), steam receivers and containers (S. 30), air receivers (S. 31), watersealed gas-holders (S. 33).

Means of Escape in Case of Fire

District councils, moreover, are particularly concerned with the provisions regarding fire escapes.

In the case of (*a*) factories in which more than 20 persons are employed; (*b*) factories constructed or converted as at July 30, 1937, and in which more than 10 persons are employed above the ground floor; (*c*) old factories in which more than 10 persons are employed above the first floor or above 20 feet from the ground; (*d*) factories in which explosive or highly inflammable materials are stored or used [see S. 34 (13)], a certificate must be obtained from the district council to the effect that the factory is provided with a suitable means of escape in the case of fire, a certificate which can only be given by the council after a proper examination. The certificate, moreover, must specify the various matters and particulars required by S. 34 (1).

Inspectors have certain powers, moreover, and they can take steps to see that the requirements of the Act are observed by district councils (see Subs. 6 *et seq.* of S. 34).

Occupiers of factories are under the duty of properly maintaining and keeping free from obstruction the certified means of escape [S. 34 (2)].

Under S. 35 of the Act the duty is imposed upon district councils of seeing that all Regulations made by the Secretary of State as to the means of escape in case of fire to be provided in factories or in any class of factory are duly observed.

There are new requirements in S. 36 with regard to safety provisions in case of fire, and in S. 37 as to the proper instruction in the use of fire escapes of workers in factories where more than 20 persons are employed.

It is to be observed that under Ss. 39 (1) (*b*) an order may be made for closing a factory where it is shown that any process or work is carried on or anything is done in such a manner as to cause risk or bodily injury, and in such cases instead of ordering the closing of the factory, the court may order the occupier to take the necessary steps to remedy the mischief [S. 39 (1) (ii)].

Finally, under S. 40 the inspector may take proceedings to obtain an order for the closing of a dangerous factory even in those cases where it would be open to a local authority to take action under the Public Health Acts.

General Provisions as to Welfare

We now pass to an examination of the general provisions aimed at securing the welfare of factory workers.

A sufficient supply of wholesome drinking water, whether from a main or other source, must now be provided and maintained at suitable points conveniently accessible (S. 41). Washing facilities, including the provision of soap and clean towels or other suitable means of cleaning or drying, must be provided (S. 42).

There must also be suitable accommodation for putting away non-working clothing and suitable arrangements for drying the same (S. 43).

For female workers who do their work standing there must be sufficient facilities for sitting in their spare time (S. 44).

A new provision [S. 46 (5)] provides that any welfare Regulation which may be made by the Secretary of State may impose duties on owners and, so far as relates to the use of any facilities provided, on employed persons as well.

Special Provisions as to Health Safety and Welfare

There are a number of special provisions in relation to health safety and welfare contained in Part IV of the Act.

Irrespective of any direction to that effect which may be given by an inspector, all practicable measures must be taken to prevent the inhalation by factory workers of dust fumes or other impurities and to prevent any accumulation of the same [S. 47 (1)]. There are certain restrictions, moreover, on the use of stationary internal combustion engines [S. 47 (2)].

Under S. 49, the provision of suitable goggles or effective screens is required in the case of such processes involving special risk of injury to the eyes from particles or fragments as the Secretary of State may specify.

The practice of shuttle threading by motor is expressly forbidden by S. 50.

The use of underground rooms certified as unsuitable for workrooms, as regards construction, height, light or ventilation, or any hygienic ground or because of inadequate provision of means of escape in case of fire is prohibited by S. 53.

The enforcement of the restrictions against the use of basement bakehouses in certain cases is now placed in the hands of the district council, but inspectors are empowered to take necessary action in the event of the council's default (S. 54).

Employment of Women and Young Persons

Part VI contains numerous alterations of the law with regard to the employment of women and young persons in factories. Here there are considerable changes.

With regard to hours of employment, in the case of young persons and women, the maximum number of hours (exclusive of intervals for meals and rest) will be 9 hours per day, and 48 hours per week. The period of employment (*i.e.*, from start to finish of work) must not exceed 11 hours and must be between the hours of 7 a.m. and 8 p.m. (6 p.m. in the case of young persons under 16) and 1 p.m. on Saturdays.

The maximum spell of work is to be 4½ hours, which may be increased to 5 if at least 10 minutes interval is allowed, and there must be an interval of at least ½ hour for a meal or rest after a continuous 4½-hour spell of work (S. 70).

As from July 1, 1939, there is only to be a 44-hour week in the case of young persons under 16, but this may be increased by the Secretary of State to a 48-hour week in the circumstances set out in S. 71.

Provision is, however, made for the overtime employment of women and young persons above 16 (S. 73). The overtime, however, may not exceed 100 hours in any year nor 6 hours in any week, and it may not take place in more than 25 weeks in any year.

In counting overtime regard must be had to every period in which any young person or woman is employed [S. 73 (10) (*a*)].

The Secretary of State has certain powers of increasing or limiting the normal overtime allowed (S. 73). No overtime is permissible in any event in the case of young persons under 16, and in the case of young persons over that age the Secretary of State may prohibit or restrict the time if he is of opinion that such overtime would be prejudicial to their health [S. 73 (4)].

Miscellaneous

Part I contains a number of miscellaneous provisions. It may be noted that under S. 113 (3) it will be an offence to pull down, injure or deface any abstract notice, regulation or other document posted in pursuance of the Act.

Under S. 119 it is an offence for any person employed in a factory to tamper with or misuse any means, appliance or other thing provided in accordance with the Act for securing the health, safety or welfare of the workers therein; and every such person is required to use the proper means or appliance provided and further to refrain from doing anything likely to endanger himself or others.

NEWS FROM THE INDUSTRY

Bread Sold in Trays

New merchandising methods to increase sales of bread were advocated by W. E. Long, director of the Long Foundation of Research and of the Long Advertising Agency at the recent convention of the Associated Bakers of America in Chicago. Mr. Long is well known in the baking industry for the numerous innovations he has introduced including modernised wrapping and the "sliced" loaf.

Mr. Long insisted that bakers must keep in step with the times in merchandising bread; mere superlatives and advertising slogans were not enough to increase sales. He pointed out that restaurants and dining-rooms had brought about an unusual problem—viz., individual taste for breads of all forms served at once. For example, in each family may be found divisions of taste; one preferring rye, another white and another whole wheat bread.

This has created a problem for the baking industry, according to Mr. Long. He stressed the fact that though there might be individual preferences in each family, the purchase of different loaves to satisfy these preferences would be prohibitive because of cost and waste. He said that he had evolved a new type of machinery, together with merchandising plans and advertising copy to introduce and stimulate the purchase of bread in tray forms, to replace the conventional loaf.

According to the plan developed by Mr. Long, assortments of rye, white and whole wheat bread would be sold in trays packed in cellophane, with the "heels" cut off so that texture and quality could be seen. It is his contention that the housewife, being able to purchase the tray of three different kinds of bread, could, therefore, supply the needs of her entire family economically. Mr. Long also declared that the resulting consumption of bread would increase by at least 10 per cent.

* * *

British Honduras' Imported Food

The *B.O.T. Jnl.* reports that the total imports of British Honduras during 1937 were valued at 3,981,249 dollars. Among the imports, wheaten flour, meats, rice and unskimmed sweetened milk accounted for 218,079 dols., 129,362 dols., 76,813 dols. and 109,002 dols. respectively. These commodities were among the chief imports and, therefore, the total imports of food were probably much more than their total of 533,256 dollars.

Hilary

"Who is Hilary, what is she?"

The old song may be altered thus for we are sure that Sylvia (who by now must be but a memory) would not mind relinquishing her place in the hearts of many sentimental people if she could but have beheld the beauty of Hilary. This pseudonym hides the real identity of the beautiful girl whom Metropolitan-Vickers have chosen as their model for the 1938 edition of their famous "Girl" calendars. We have just received ours.

A few facts are all we are allowed to know. "The choice this year is a brunette born and bred in London. She was the winner of the recent 'Miss England' Beauty Competition." And that is all. To Metropolitan-Vickers' hope that we will agree she is worthy of a place in their calendar series we say "Yes," and "yes" again. We echo surely the reason is obvious, to merely see her picture, why ". . . all our swains commend her"!

* * *

A New Yeast Product

Yeast is a living cell on which mankind depends to a larger degree than is generally realised. Hitherto yeast

has only been regarded as a medium which helps to produce many of our foodstuffs, but the yeast itself is a food which contains many of the most important ingredients—protein, fat, sugar, phosphatides, etc., vitamins, especially vitamin B. Unfortunately we cannot eat the yeast as it is—only very small quantities are used for therapeutical purposes. There is now a product in Burton-on-Trent—the yeast centre—which is a pure Yeast Extract called "Yeatex" manufactured by a new process from brewers' yeast, which has found immediate appreciation on account of its attractive aroma and flavour.

Yeast, as a living cell, contains not only the ordinary and well-known products, protein and such, but also many enzymes and ferments, powerful substances which split the albumen into amino acids. But what are amino acids? Amino acids are the building materials for the protein of any human body. All the proteins of foodstuffs are at first split in the stomach or intestines into amino acids. Thus from plant and animal protein we form our own specific body protein.

The splitting off properties of the yeast enzymes by producing the amino acids of the yeast proteins help to prepare a more palatable and digestive product—"Yeatex".

"Yeatex" is an absolutely pure yeast extract, containing the most important ingredients of the brewers' yeast, but in a form which has a specific meatlike taste and flavour. The living yeast cell which produces this amazing product does more than any artificial process can do.

"Yeatex" possesses both flavouring and the highest food value. It is a natural product which can be used everywhere, in the kitchen for flavouring soups, sauces, vegetables, even meat itself. It is a food which the children like if spread on bread in small quantity, being highly concentrated, indeed nearly the highest concentration possible.

It is evident that this special yeast extract must find its way also into hospitals, in the sick-rooms. There is no other protein substance—whether meat, fish, fruit or vegetable—which can be compared with "Yeatex" regarding digestibility, nor other food so concentrated, easily prepared and providing such satisfactory results. It tastes good, contains all the important amino acids, is rich in vitamins and can be used with benefit in food manufacturers' kitchens, hospitals, institutes, clinics and the household.

* * *

From Goswell Road, the wrapping and labelling machinery makers, Jagenberg Limited, have removed to Africa House, Kingsway, W.C. 2.

New Royal Society Fellows

At the annual election of Fellows of the Royal Society held on March 17, 1938, the following were elected:

G. D. Bengough, Consultant to the Chemical Laboratory, Department of Scientific and Industrial Research; C. H. Best, Professor of Physiology, University of Toronto; W. Brown, Professor of Plant, Pathology, Imperial College of Science and Technology; J. W. Cook, Professor of Chemistry, the Research Institute, Royal Cancer Hospital; T. L. Eckersley, Research Physicist, Marconi's Wireless Telegraph Co.; G. I. Finch, Professor of Applied Physical Chemistry, Imperial College of Science and Technology; W. E. Gye, Director of the Laboratories of the Imperial Cancer Research Fund; W. V. D. Hodge, Lowndean Professor of Astronomy and Geometry, University of Cambridge; J. S. Huxley, Secretary of the Zoological Society of London; J. Jackson, H.M. Astronomer at the Cape; Sir Robert Mond, Chemist and Egyptologist; J. E. Richey, District Surveyor, H.M. Geological Survey; F. S. Russell, Naturalist at the Marine Biological Association; B. F. J. Schonland, Professor of Physics, University of Cape Town; F. S. Sinnatt, Director of Fuel Research, Department of Scientific and Industrial Research; E. M. Smith, Senior Research Assistant, Plant Virus Station, Cambridge; E. Stedman, Lecturer in Department of Chemistry in relation to Medicine, University of Edinburgh; C. E. Tilley, Professor of Mineralogy and Petrology, University of Cambridge; W. E. S. Turner, Professor of Glass Technology, University of Sheffield; S. H. Woollard, Professor of Anatomy, University College, London.

* * *

T. Crosbie-Walsh, F.I.C.

Mr. T. Crosbie-Walsh begs to advise his friends and clients that his new address is: 8, Westover Road, London, S.W. 18. Telephone: Battersea 7968.

* * *

Staggered Holidays With Pay

There has been much written and talked about on the question of holidays with pay for manual or production workers. Now that these deliberations have secured holidays with pay for an immense number of non-black coat workers the question of staggering holidays to avoid seaside congestion is raised. The idea has been put to practical use in at least one famous holiday resort. Blackpool begins a long summer season with a full complement of amusements and other attractions as early as the beginning of next June.

Latest Example of Food Refrigeration

One of the most up-to-date buildings in Great Britain is the Harefield Sanatorium at Uxbridge (near London) belonging to the Middlesex County Council. Our recent symposium on the subject and its real importance to the food industry will make this note on its extensive refrigeration plant, which represents the latest scientific principles, alike as regards efficiency, general design and arrangement, automatic control, and safety devices, of no little interest. It was supplied by the Pulsometer Engineering Co., Ltd., of Reading (Berks).

The main portion of the plant deals with food storage and ice making, and includes a medium-speed ammonia compressor of vertical enclosed type, running at 300 revs. per minute, driven by "V" flat belt from a 5 h.p. electric motor. On the usual lines the cooling effect is transmitted by chilled brine (salt solution), which travels in a continuous circuit from the main brine storage tank through four cold chambers, for meat, fish, bacon, cheese, milk, and butter, a cook's cold store, and an ice-making tank, which has a normal production of 112 lbs. of ice per 24 hours. This circulation is given by a centrifugal brine pump, separately driven by a direct coupled electric motor.

The compressor is automatically controlled by the temperature of the brine in an insulated brine tank, which is installed in the main engine-room, and its function is to ensure that the temperature never varies more than 3° F. within a predetermined level.

* * *

Celotex in a New Factory

Work on a large new factory for the manufacture of structural can fibre in all its forms is nearing completion on the North Circular Road, Stonebridge Park, Middlesex.

The new factory, which is being built for Celotex, Ltd., occupies some 13 acres with an extensive wharf adjoining the Grand Junction Canal.

The normal output of the factory will be about 12,000,000 square feet of Celotex hard board and 30,000,000 square feet of Celotex insulation material per annum. The machinery and the layout of the works, however, are such that total output could be increased to 140,000,000 square feet per annum if required.

Celotex is made from bagasse, tough fibres of sugar cane after the sugar has been extracted. The fibre is ideal for the fabrication of a strong insulating board because of the natural insulation properties of the minute air cells within the fibres, the "saw tooth" structural surface of the fibres and their unusual length, strength, toughness and resiliency.

As a structural material it combines excellent insulation with bracing and stiffening strength superior to wood sheathing, while used as a plaster base it combines insulating value with high plaster bonding strength. Acousti-Celotex, which will also be produced in the new factory, is now a well-known medium for the control of sound and noise within enclosed spaces.

The demand for Celotex cane fibre board has been growing steadily in the past few years and it is already employed in over a million buildings of every kind in America. It is to meet increasingly big demands in Great Britain and the Empire and throughout Europe that the new British company has been formed and the factory built.

* * *

Queensland Exports More Food

Exports from Queensland during the six months ended December 31 last are the highest for at least seven years. Butter accounted for £1,395,407, beef for £1,875,392 and sugar for £3,583,267, of the total export revenue of the State.

The average export value of sugar is nearly £A.9 per ton, the net realisation to the producers being £A.8 per ton. The heavy shipments, the additional value of which was just over £1,000,000 as compared with the similar period in 1936, reflect the largest yield recorded in the history of Queensland.

Butter exports show a more favourable season in producing areas, as although for more than 12 months prior to the last quarter of 1937 drought conditions had prevailed in the main dairying districts, rain brought very rapid improvement, and further heavy rains in January, 1938, over wide areas indicate every prospect of butter production reaching greater heights.

The Trade Commissioner adds that these rains have assured a good season for farmers, dairymen, pastoralists and graziers, and, although there is no certainty as to the course of export prices, it seems certain that further large quantities of beef, butter and wool will be available for shipment during the next few months. *B.O.T. Jnl.*

* * *

Mr. P. Robinson to visit U.S.

Alderman Philip M. Robinson, J.P., Managing Director of Robinson and Sons, Ltd., Chesterfield, and his son, Mr. Ernest B. Robinson, of the same company, are to visit the U.S. and will arrive in New York on May 9 on the *Queen Mary*. While in the United States they will visit a number of box manufacturers.

DIETETICS WITH A KICK

T. Crosbie-Walsh, F.I.C.

THE FOOD INDUSTRY has no reason to complain of neglect by authors towards food matters, to judge by the spate of books during the past year—a few quite monumental and bearing witness more to the industry than the erudition of the writers; some written for the sake of writing them, and some because the writers couldn't help it. Plentiful signs of such legitimate urge are evident in one of the latest productions.*

The dedication is "To our Respective Fathers Who Might Still Be Alive if Nutritional Knowledge had been Complete During Their Lifetimes". Apart from some misgivings about an over-crowded and unattractive world, the thought occurs as to whether the implication is that nutritional knowledge is really complete or rather that it is that we, as doddering great-grandfathers, shall presently disport ourselves among our descendants, discussing the latest food adjunct with them? The knowledge is accumulating but it is doubtful whether it is being sufficiently applied. Sad to relate, it cannot be applied in a significant percentage of the people for economic reasons!

Evolution

A good slogan for the book might be the first sentence on page 80—"Every thread of nutritional discussion leads back to the spool of evolution". The racial argument emerges throughout and gives a sense of originality of treatment. The arguments and suggestions are ingenious and stimulating to the reader of those long lists of calorific values which sometimes hide under the name of textbooks.

Dr. and Mrs. Furnas must have had lots of fun during their writing. The pace and manner are set on the first page. The thesis is proposed in the first 8½ pages—"A Man must Eat". Esau thought his bargain with Jacob a good one. "Mark Antony gave his cook a city because he had prepared a meal that pleased Cleopatra. Everyone was satisfied with that exchange, too." The reviewer who is obliged, by economic circumstances or from sheer cussedness or any other reason, to wade through thousands of pages of the new food literature begins to sit up and take notice. There are 364 pages (including the index), and the index pages are almost the only ones without a chuckle, although let me hasten to add that although the authors have succumbed at times to facetiousness, their background is serious enough. It is food history; food science; speculations about food in prehistorical times—and dozens of other things—without tears.

The Menace of Hunger

Hidden skilfully (although perhaps unintentionally) are warnings which we, in England, might well take to heart, at this present juncture. "Hunger of only a few days' standing drives most people into wild and dangerous moods." I am not going to labour the point here, but there is a lot of talk about what *may* happen if we find ourselves unprepared in the matter of food supplies in the next war, which might well be linked up with that statement.

We are given some quaint and plausible instances of the influence of foodstuffs on the history of the world; for instance, that of sugar. Then there are spices.

> "If sugar has played an important rôle in world history, the part played by spices has been even more significant. Fifteenth-century Europeans had no refrigerators, hence needed spices for preservatives, and Columbus started out to find a route to India that was free of nomad gangsters. By the beginning of the seventeenth century, trading with India was largely in the hands of the Dutch, and much of their business was the selling of spices to the English to keep their meat and other food edible. The Dutch overplayed their hand by keeping the monopolistic prices unreasonably high, and the British East India Company was formed with a monopoly, granted by the Crown, from the Cape of Good Hope eastward to the Strait of Magellan. The English went after their own spices. It was the beginning of the modern British Empire."

Vitamin D

The Neanderthal man died off for want of vitamin D and could not use sunshine, as there was precious little of that. However, he might have "successfully substituted the vital organs of animals for sunshine and have survived".

The Cro-Magnon did very much better. And he had the quite good innings of 10,000 years. He was certainly wasteful of food, "what was a mammoth more or less to the Reindeer Man?" His survival and his excellent condition (as exemplified by the bones he has left) is claimed to be partly due to eating the blood and vital organs of his consumption animals and leaving the parts we value most for the scavengers.

And so we are taken through the centuries; through the (comparatively recent) early ramblings in nutrition on to the present day.

We are steered joyously through metabolism. We are told that we exist by the grace of "the good little green plants", but carbohydrate, protein, and fat requirements are well and faithfully recorded in grammes. But, again, the theme is lightened by:

> "The most famous attempt to do without plants is the oft-exploited, get-rich-quick, gilt-edged, sure-fire cat and rat farm. Cats and rats are raised on the same farm. The cats are killed and skinned. The fur is sold to make mink coats. This is clear profit. The cat carcasses are fed to the rats. The rats are later fed to a new supply of cats and these cats are finally fed to a new supply of rats—*ad infinitum*. If you can see the error of the argument in less than ten minutes you are above the average. If you fail to see it within half an hour, your savings aren't safe, for there are still shysters selling stock in such schemes."

Not a very new story, but worth the re-telling even for the financial moral pegged on.

The bare statement that "the average English diet is still abominable" renders the temptation of a *tu quoque* too great to be resisted. What about stodgy cakes, sweets

* *Man, Bread and Destiny. C. C. and S. M. Furnas. London. Pp. 364. 10s. 6d.*

and iced water? I have an American cookery book with the title 1,000 *Ways to Please a Husband*, which would lead one to the conclusion that to please an American husband, you fed him extensively on carbohydrates.

Cannibalism

The picturesque story about Richard Cœur de Lion eating (without knowing it till afterwards) the Saracen's head is linked up with the consideration of the proteins and the assertion that "when we abandoned cannibalism our social gain far outweighed our nutritional loss, but the dietetic advantage still stands".

We are fed nowadays both bodily and mentally on vitamins, but I liked reading the opening paragraph on vitamin D: "The swigging of cod liver oil is an old Scandinavian custom. . . ." I should rather have liked to have read a theory as to exactly why the cod manufactures and stores vitamin D. His ambit is dark enough. Dr. Furnas surely has a good theory about this?

Teeth

The subject of teeth is an inexplicably fascinating one to the average man and woman. After the talk about the latest film pictures has been exhausted, to turn the conversation to teeth will carry one over those silences which sometimes—although rarely—occur when people gather. Everybody's dentist has told them exactly how to have good teeth (while he is filing away at their bad ones). Many who possess a "double set" defensively adopt the attitude of "let them as have 'em, gnash 'em".

The problem of teeth is one which is far from solution. Opinions differ. No doubt natural foods produce good results, due, according to some authorities, to acid-base equilibrium. The case of the residents on the island of Tristan da Cunha seems to suggest that they are on the right track. The Furnases devote a good part of their tooth chapter to the work of a Martha R. Jones, although they hand out some offerings to Drs. May and Edward Mellanby. They can't resist having another little jab at us. "Being English" writing of the Mellanbys) "probably gave them the impetus, because English teeth are even worse than American." Let that pass—perhaps it's true.

Corned Beef

There are one or two points which, however, cannot be passed without criticism. Authors of books should be very careful when they find themselves in a caustic, apart from a whimsical, mood. For instance,

> "If you enjoy corned beef, eat it for pleasure but don't expect much nourishment from it. All of its healthful juices have departed into the brine solution in which it was originally pickled. The most advertised thing in England is the drink Bovril ("Beef in Brief"), which is a lucrative by-product of corned beef manufacture—the juices that the meat buyer doesn't get. The corned beef eater gets the fibre, the bulk and a full stomach, but the Bovril drinker gets the more valuable minerals and a small amount of vitamins. This practice of selling food twice is excellent for business."

Corned beef roughly corresponds to domestically prepared boiled beef, and therefore *a certain proportion* of the salts, meat bases, etc., are unavoidably taken out. What is left is more than half the salts and what is termed the fibre. Yes, meat fibre. First-class protein with a weight for weight superiority over fresh meat in this substance, owing to the abstraction of moisture . . . good for small budgets. Corned beef has its particular place in the list of foods and about 50,000 tons of it is consumed in this country per annum. One would imagine from the excerpt quoted that one might just as well eat straw!

Whipping of Animals

The thesis that "when animals are fatigued before death or suffer a lingering death, their flesh sooner becomes tender than when they have been killed suddenly" is a questionable one. Again, "Germans make flesh of pig more tender by whipping it to death!" However much we admire—or dislike—German methods, we deplore such painful generalisations, and the conclusion that we "moderns have been a little lax in keeping up to early standards in the fine points (!) of the art of killing" is an amazing statement. May our laxity continue! As a matter of fact, in the large freezing establishments the precaution is always observed that animals are well rested and cool before they are killed. I personally can testify as a result of my own experiments that the newly killed flesh of a tired or harassed beast is not more acid than that of a rested animal. The experts do not kill rested animals for reason of fear of lactic acid but of other substances which are present in harassed ones.

Aphrodisiacs

Is it possible that "there has been and *still is* (italics mine) more human effort thrown down the aphrodisiac rat-hole trying to induce or prevent the natural passions, than in almost any other department of human folly". I have travelled in a good many parts of the world—talked with all sorts and conditions of men, some of whose conversation omitted practically no aspect of sex, and the only things I have ever heard in this connection are: (1) that celery salt is an aphrodisiac and (2) that a "love potion" can be made from various ingredients which I have forgotten, save that the brains of an owl, killed in moonlight, formed the principal item; this information being given to me by an honest-to-goodness Argentine *gaucho* in the Rio Seco.

Psychological Aspects

There is a great deal of exaggeration expended upon the psychological aspects of food. Furnas mentions "the amateur dietitian of the debunking school as a contender that appetite is a completely adequate guide for proper selection of food". He doesn't agree, and I agree with him. And yet we had a talk "by a physician" on the wireless a week or so ago who sounded at any rate as if he deplored the attention of the ordinary man to scientific dietetics and that personal preferences were sound guides for feeding.

What could be written about and what is suggested by the Furnases would fill this journal. But enough has been said to whet the appetite of those who appreciate their science garnished with wise-cracks, informed by a keen appreciation of past and present food problems.

PLANT AND MACHINERY

Protection from the Precious Metals Group

Rhodium, one of the precious metals of the platinum group, was discovered and first isolated by Wollaston as long ago as 1804. It was, however, very little known or used except in small percentages as a hardening medium in certain alloys until the development of the rhodium plating process of the present decade. Nowadays it has an especial merit as a high-class, stainless finish for a variety of industrial products, not the least of which is the plant of the food manufacturer.

Johnson Matthey and Co., Ltd., produce rhodium and will be glad to answer any queries concerning it.

* * *

Electrical Equipment

One of the latest developments in connection with the British Thomson-Houston range of small motors is the introduction of a new line of geared motor units. Following the success of earlier types of these equipments, it was recently decided to extend the range, with the result that the new group of units offers a choice of four classes of gear, including single-reduction spur, double-reduction spur, triple-reduction spur, and single-reduction worm wheel, depending upon duty, rating, and required speed at output shaft. These B.T-H. motors and gears are so designed and built that the one is a true complement of the other, and the combination of an electric motor and speed-reducing gear in one compact unit renders these equipments greatly superior to the hitherto more usual arrangement of a motor and separate gear.

* * *

Activated Carbons

Solvent recovery, rectification of solvents, air drying, deodorisation and the removal and collection of dusts and mists call for the extensive use of activated carbons which have been suitably prepared for the purpose indicated. There is obtainable, from Price, Stutfield and Co., Ltd., a leaflet describing the properties and uses of their speciality carbons: "Acticarbone" for solvent recovery, etc., "Actifilter" for the removal of dusts, etc., and "Actisec" for drying air and gases for industrial and domestic use. In addition to special gels for drying, the "Mariller" process has been elaborated for the production of absolute alcohol. Information and advice concerning these products is obtainable from the company.

Chain Drives

A good-looking leaflet from Renold and Coventry Chain Co., Ltd., describes and illustrates applications of Renold Chain Drives to machinery in food factories. Well-known food manufacturers are mentioned as users of the drives for which is claimed cleanliness, reliability, compactness and power saving.

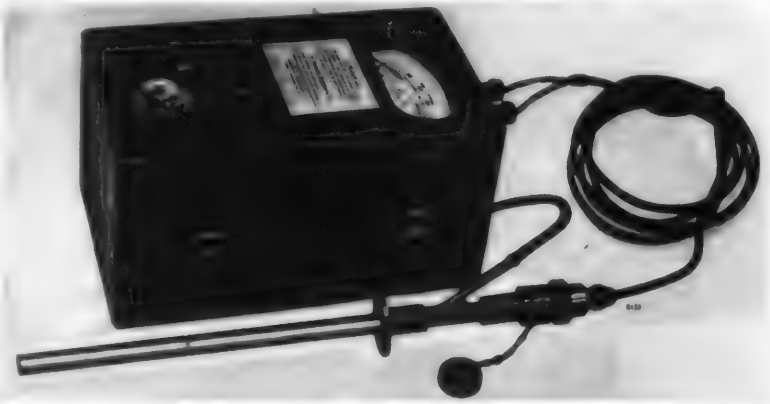
* * *

Keep Clean—to Save

It is a fact that an average 20 h.p. motor in a dusty condition may be carrying as much as 40 lbs. of dirt and mud. The effect of this on the vehicle's performance is briefly summarised and the remedy, power washing, is outlined in a leaflet received from the Power Plant Co., Ltd., of West Drayton.

* * *

Cambridge Portable CO_2 and Temperature Indicator



(Courtesy, Cambridge Instrument Co., Ltd.

Shown above is a compact apparatus for measuring the percentage of CO_2 in flue gases, and also their temperature. It is particularly useful for consulting and inspecting engineers and for checking permanent installations in large power plants. It is also specially suitable for use on board ship. The CO_2 percentage is determined by an electrical method which eliminates chemicals and glass work. The indicator contains the CO_2 meter and a pointer galvanometer, together with the various adjustments and switches, and a specially designed hand pump for drawing the gas past the meter. The CO_2 meter comprises a metal block containing four platinum wire spirals in separate cells, two of the cells being exposed to the gases drawn from the flue by means of the pump, and the other two cells being filled with air saturated with water-vapour. These spirals form the arms of a Wheatstone Bridge circuit. When an electric current flows in the circuit, the spirals become heated and lose heat to the walls of the cells, their temperatures, and, in consequence, their resistances, depending upon the thermal conductivity of the gases surrounding them. Changes in the percentage of CO_2 in the flue gas surrounding two of the spirals give rise to changes in the conductivity of the gas, with consequent movements of the galvanometer pointer over a scale calibrated to read in CO_2 percentage (0 to 25). The same galvanometer is also used to indicate the temperature of the flue gases, a second scale of temperature (0° to 1,000° F.) being fitted above the CO_2 scale.

* * *

Boiler Patents Transferred

The patents belonging to Mr. W. J. Niven relating to thimble tube boilers have been taken over by Stockton Chemical Engineers and Riley Boilers, Ltd., who now have the sole rights to manufacture and sell these boilers. Mr. Niven has joined the Company as chief of the department concerned with the boilers.

Factories Act, 1937

The ways in which gas heating, lighting, etc., can be of help in complying with the restrictions and conditions laid down by the new Factories Act, are described and illustrated in a new booklet issued by the British Commercial Gas Association. The new Factories Act as it affects food factories is explained in a summarised way by Mr. T. J. Sophian in this issue.

Temperature Measurement on Boiler Plant

Assuming a boiler plant equipped with superheater, economiser and air preheater, the essential measurements may be listed as follows :

(1) Saturated steam.
(2) Superheated steam.
(3) Feed water at economiser inlet.
(4) Feed water at economiser exit.
(5) Flue gas at economiser inlet—corresponding to boiler exit.
(6) Flue gas at economiser exit—corresponding to air preheater inlet.
(7) Air preheater exit—this reading determining the irrecoverable heat loss, *i.e.*, final exit gas temperature.
(8) Air leaving air preheater, *i.e.*, hot air to grates.

Fig. 2 shows a cross section of a typical boiler plant of this type, with the foregoing points of measurement indicated by the numbers given above.

The comparison of the superheated and saturated steam temperatures gives the steam temperature rise through the superheater and consequently any abnormal variation from the correct temperature rise will be noted.

The superheated steam temperature is a factor of the highest importance and must obviously be maintained at the figure for which the particular steam consumers were designed.

As the boiler becomes dirty, the superheated steam temperature will be inclined to fall because of the reduction in the rate of heat transfer from the gases to the steam in the superheater. Thus, this measurement serves as an inferential guide to the condition of the boiler, but must, of course, be read in conjunction with the final exit gas temperature, because as the one falls the other will obviously rise.

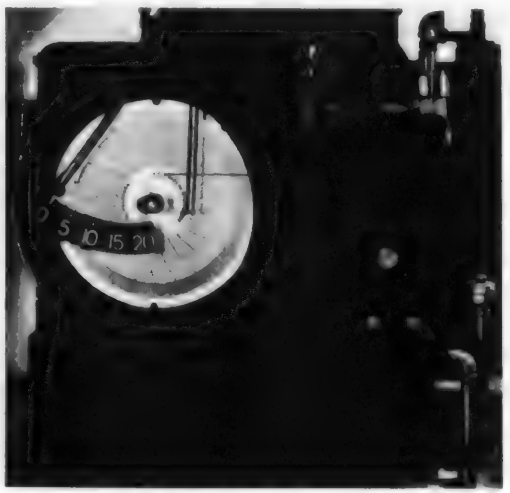
Watch must be kept upon the superheated steam temperature also in order to note incipient tendencies to priming, this being indicated by a sudden drop in the reading. This characteristic is peculiar to priming in the sense that a fall in temperature through any other cause will be more gradual.

The measurement of the feed-water temperature at the economiser inlet is, of course, essential to the computation of the overall boiler efficiency, whilst the inlet and exit feed-water temperatures, read in conjunction with the temperature of the flue gases at the economiser inlet and exit, determine the efficiency of the economiser in terms of heat transfer and provide a guide to its condition. The conditions existing in many plants also make it desirable to emphasise the importance of maintaining the predetermined feed inlet temperature in order to avoid condensation from the flue gases and its consequent effect upon the heat transfer surfaces.

The temperature of the air leaving the air preheater, *i.e.*, air supplied to the grate, requires close control. The object is to secure the highest desirable combustion chamber temperature, with a corresponding improvement in heat transfer efficiency, but without advancing either the stoker or combustion chamber maintenance costs. It is necessary also with certain classes of fuel to be careful to avoid too high a temperature with consequent tendency to slagging.

When considering the final gas temperature, the CO_2 reading must also be taken. It is a commonplace that for a given load the temperature of the flue gas decreases with the increase in CO_2 content, up to the point where the theoretical maximum CO_2 is approached, with consequent secondary or delayed combustion, causing a rise in the flue gas temperature. Since the increase in the percentage of CO_2 decreases both the weight and temperature of the flue gas, it follows that an increase in the percentage of CO_2 reduces the chimney loss, and therefore increases the overall boiler efficiency. Too high a back-end temperature may therefore not be due to the condition of the heat transfer surfaces, but to excess gas as indicated by too low a CO_2 content.

It will be noted that the efficiency of heat transfer is determined at all the various stages, and the object is to permit the engineer-in-charge to determine the efficiency of his plant as a complete unit, and also the general efficiency of its component parts. Its purpose is to maintain the best operating temperatures as laid down in the design of the plant, to check the efficiency of heat transfer at each stage of the process, and to disclose any defect in any part of the plant which is affecting the overall operating efficiency.



A self-contained indicating and recording CO_2 meter made by Electroflo Meters, Ltd.

It is necessary, however, to emphasise the fact that this discussion concerns temperature measurement only, and whilst the measurements inform the operator of the general trend of operating efficiency and condition of the plant, temperature measurement alone is insufficient. For example, the heat transfer rate is obviously affected by velocity as well as temperature, whilst, as shown above, the irrecoverable heat loss is determined by the weight and quality of the flue gas as well as by its temperature.

Duplicated Measurements.—All of the above measurements will be made by a multipoint thermo-electric type indicating pyrometer. The measurement of the superheated steam temperature is usually duplicated, however, by a 12-inch diameter mercury-in-steel or other expansion type temperature indicator for the reason previously advanced, *i.e.*, that it may be noted with ease by the boiler attendant from almost any point of the firing aisle. Frequently also the measurement of the final exit gas temperature is duplicated in similar fashion, whilst a multipoint temperature recorder will be installed to give continuous written records of the operating temperatures maintained, in order that these may be held available for subsequent analysis. The temperatures to be recorded will normally be :

(*a*) Superheated steam.
(*b*) Feed water at economiser inlet.
(*c*) Final exit gas.
(*d*) Air to grate.

Installation of Thermocouples.—In applying the thermocouples of thermo-electric pyrometers to the measurements referred to, several points must be borne in mind. Whilst the statement is quite elementary, it is not always realised that only the tip or welded junction of the thermocouple is sensitive to the temperature being measured. Any unnecessary extension of the thermocouple, therefore, only changes the point of temperature measurement. In locating thermocouples in steam and water pipes it is desirable that the immersion be such as to bring the tip of the thermocouple to the centre of the pipe, and for pipes up to 12 inches in diameter the rule is therefore an immersion of one-half of the pipe diameter from the pipe wall.

This point is of considerable importance in the case of flue gas temperature measurements, for it is well known that stratification of the gases has to be contended with. For this reason the flue gas thermocouple is provided with an adjustable stop flange in order that the amount of immersion may be governed, and maintained at that shown to be the most desirable by experimental exploration.

Averaging thermocouples—and also electrical resistance bulbs—are frequently employed in the larger plants, these comprising a number of elements connected in series, or parallel, to give an approximate mean temperature.

The magnitude of the e.m.f. developed by a thermocouple is determined by the difference in temperature between the hot and cold ends and obviously, therefore, the cold end must be maintained at a known temperature or a correction made automatically or manually, or be calculated from accurate temperature readings taken at the cold end of the thermocouple. Thermocouples are therefore connected to thermo-electric pyrometers by special connecting leads known as compensating leads, which have the same metals, or metals having together the same thermo-electric characteristics, as the thermocouple wire. These leads transfer the cold junction from the head of the thermocouple to the indicator terminals, and the cold junction error is therefore limited to the changes in temperature in the air surrounding the instrument. Modern thermo-electric pyrometers are, however, fitted with thermostatic cold junction compensators, so that the pointer position is automatically adjusted to agree with the temperature of the surrounding air and in this way complete compensation is effected.

These considerations do not, of course, arise with electrical resistance thermometers, the connections of which are made with ordinary copper wire.

Installation of Expansion Thermometers.—As the expansion thermometer is a self-contained instrument comprising the indicator or recorder, with the sensitive element connected by a previously determined length of capillary tubing, the greatest possible care is necessary in its installation. If through careless handling, too sharp a bend, or accident, a fracture occurs, it is necessary for the complete instrument to be returned to the makers' works for an involved and expensive repair. After the fracture is located and repaired, or the capillary tubing renewed, the complete system must be refilled, calibrated and tested.

The ever-present possibility of damage to the capillary tubing therefore makes it desirable that separable pockets be provided in steam and water pipes for the reception of the sensitive bulbs, which will permit them to be withdrawn whilst the main is under pressure. The employment of a separable pocket obviously introduces the disadvantage of a time lag in the response of the instrument to changes in temperature, and furthermore causes the instrument to give low readings, as some of the heat escapes along the separable pocket without reaching the sensitive bulb. These effects can be reduced by making the separable pocket a mercury bath, where the pocket is vertical, and the measured temperature does not approach the mercury boiling point. For horizontal pockets, and the measurement of the higher temperatures, solder, or clean iron filings are commonly used.

(Abstracted from *The Steam Engineer.*)

A tilting pan made by John Thompson (Dudley), Ltd., for jam manufacture.

Multelec

The Kent Multelec, an instrument capable of recording a number of conditions such as temperature, *p*H, electrolytic conductivity and others known to food manufacturers, is described in a sixteen-page booklet received from George Kent, Ltd.

Temperatures and Enterprise

One firm at least are making the most of the new Factory Act of 1937 which comes into force July 1, and which stipulates that a reasonable temperature be maintained in each workroom. The British Rototherm Co., Ltd., seize upon it as the ingenious reason for a booklet they are issuing to publicise their Rototherm patent all-metal temperature gauges. Such enterprise is refreshing in the usual run of trade advertising.

* * *

Vegetable Parchment

Vegetable parchment has been described as the "purest product of the paper industry"; no other materials are used in the manufacture of vegetable parchment of neutral quality but the pure fibre and pure parchmentising acid, the latter being washed out completely during the final stages of manufacture. The purity of vegetable parchment has been confirmed by recent analysis. (The Effect of the Wrapping Material on the Fat of Fatty Foods, by W. L. Davies, *Jour. Soc. Chem. Ind.*, Vol. LIII, pp. 117T-120T, April, 1934.)

In connection with the packing of jam and fruit products, the makers (British Vegetable Parchment Mills, Ltd.) claim that the two most important points lie in the fact that vegetable parchment is air-proof, and, further, that it is absolutely sterile.

Here is a machine for the confectionery maker. It is a caramel cutting and twist wrapping machine (class R.A.F. 500) and is only one of the many different types of food manufacturing machines manufactured by Rose Brothers (Gainsborough), Ltd.

Book Reviews

When Canners Trekked Across a Continent

Every business man is interested in two subjects—his work and his competitors. Here is a rather special kind of book which will appeal to those who do not normally describe themselves as "readers". Newspapers find more readers than technical magazines, so it would appear that a book which gives all the news, past and present, will find more readers than a textbook.

News of the past becomes history. History based on dates of happenings is dull, but history which records details of the sayings, movements, and private lives of human individuals is bright, and if it is a history of individuals who have done the work that brought us to the work we are doing now, it is of absorbing interest.

Earl Chapin May has in some uncanny, miraculous way got together intimate details of the men and women who built up the American canning industry. He rightly groups canners in the U.S. into a clan. His stories in *The Canning Clan* of their movements in bunches, of their treks across the Continent with their mobile canneries, are as interesting to the canner as the history of the Scottish clans is to the exile. The names which we know to-day crop up in the earliest pages of his book.

One would almost be led to believe that Mr. May had lived and moved with all these people instead of with only some of them. He motored 25,000 miles and spent 36 weeks picking up drama and occasional comedy from members of the canning clan who, like their forebears, are still pioneering in an industry which is never static, always feeling forward and constantly experimenting.

The sanitary can made its appearance about 1900. We are told almost all the details of its development. Previously, the can had been made whole and the fruit and vegetables broken, torn and lacerated while being pushed through a small hole which was made in the top.

Almost everything we accept as standard to-day is traced in the history of this book. The first flangers; the steps which led up to the double seamer; the first primitive solution of gum and asbestos, the precursor of the present sealing compound; and the details and the pains attendant on the development of these inventions are outlined.

Our old friend the swelled can crops up early in the book. In 1897, Messrs. Prescott and Underwood, having read a paper on bacteriology and sterilising in the canning industry, were invited to address the Atlantic States Packers' Association. Their hearers, although mostly of Eastern ancestry, sat back in their chairs like men from Missouri, tough and contentious! Here and there the visiting speakers thought they could see something approaching a sneer on the face of some delegate who might be thinking: "What are bacteria? And, anyhow, what can bacteria have to do with practical canning? The things shouldn't be mentioned—in public, anyway."

After describing micrococci and bacilli, Mr. Underwood continued:

> "Two cans of corn were inoculated with some of these germs and placed in an incubator at a temperature of 89° F. about four o'clock one afternoon. The next morning both cans had burst, the tops being torn off completely and the ceiling of the laboratory decorated with kernels of corn."

Various packers inhaled excitedly.

"This pressure," announced Mr. Underwood impressively, "was caused by fermentation and formation of gas—by rapid growth of the bacteria."

Here we meet the original Max Ams, the Apperts, the Spragues, in fact at the end of the book there is given as an addenda the "first families in canning", which, after starting with the Apperts, then continues entirely with the U.S. families. Here the author traces through three or four generations the families in the canning clan, many of which are still in the business. His list of dates will prove a godsend to many a speaker on canning subjects and the index is indeed a guide to the whole history of American canning.

The Canning Clan. By Earl Chapin May. Pp. 60 + 24 *index.* $5\frac{1}{2}'' \times 8\frac{1}{4}''$. *12s. 6d. net.*

Chemical Industries, 1938

The appearance of *Chemical Industries* each year is now so established that it has become an annual event of considerable importance, and in previous reviews it has been pointed out that annual publications of this nature enable comparison to be made from year to year of the progress attained in the various industries. This is only possible when the work is thoroughly revised and brought up to date, and, as with previous years, the twelfth edition has been revised and extended in many directions.

Considerable importance attaches to the familiarity with the contents ultimately attained by the user, and the same order has been observed in the arrangement of the 10 sections of this book. It is not necessary to relearn the order in which the various sections occur. The cut "thumb" index, a useful innovation, has been retained and the index to the technical data has been extended, thus increasing the accessibility of information. The sections in the following order deal with Materials and Construction, Power Plant, Chemical Plant, Size Reduction, Separating, Handling, Instruments, Heavy Chemicals, Fine Chemicals and many useful tables. The up-to-date and extensive bibliography rounds off the volume.

A striking acquisition to this publication is the inclusion of a dictionary of raw materials for paint manufacture. This outlines practical methods and characteristics of the various substances and covers the allied industries as well. Thus the dictionary is of use to the industry at large and not merely to that section under which it is tabulated. The tables of physical constants of drugs, pharmaceuticals and chemicals have been amended and in some cases considerably extended in their scope. Pharmacists, manufacturing chemists and others will appreciate this fact. Perfumers and soap makers will find considerable interest in the revised dictionary of materials for perfumery. This dictionary includes information about new oils, resins, and products generally. As is customary in this publication, carefully selected advertisements are grouped at the end of each section and provide not only illustration but much advice pertinent to the subject. It is almost unnecessary to say that *Chemical Industries*, 1938, will find as ready a place in every library and laboratory as its predecessors. In annual productions of this kind it is difficult to increase the general utility, but this has without doubt again been accomplished, and must be a source of satisfaction to editor, publisher and possessor.

J. P. I.

Chemical Industries, 1938. *12th Edition. Pp. lxxix* + 382. *London. Leonard Hill Limited.* 10s.

Agriculture and War

The word "realist" is a much-used word nowadays. Judged by his recent book, Lord Lymington is certainly a realist, although his realism is of a piece with idealism. That he has faith in the ultimate fate of his country is evidenced by the statement that he would have sought a happier corner of the earth to start afresh, but for his faith in the

(*Continued on page* 176.)

Government Leads the Way at Empire Exhibition

FIFTEEN Government departments have been working for many months on special exhibits to be shown at the Empire Exhibition at Glasgow. In the Government Pavilion, which will dominate the North-West Section of the Exhibition, the Department of Scientific and Industrial Research, under the organisation of Sir Frank Smith, will have an exhibit, and the Ministry of Health in co-operation with the Board of Education, the Scottish Department of Health and the National Fitness Council with their "Fitness Wins" cry, will also be represented.

Elsewhere in the Exhibition the Ministry of Agriculture and Fisheries and the Forestry Commission in co-operation with the Scottish Department of Agriculture and the Scottish Fishery Board will exhibit. The Army, Admiralty, Home Office, G.P.O. and the Ministry of Labour are also including displays.

Notable exhibits will include the completely equipped Scottish fishery research ship *Explorer*, a central health clinic with X-rays and dentists, the application of chemistry in keeping the soil fertile and a modern general hospital complete with kitchens, working lifts, etc.

Among twenty other models to be shown by Government departments is a talking mechanical man, four times life size, who tells how his body works. He has cameras for eyes, test tubes for pancreas; and the heart, lungs and digestive apparatus are all shown in action.

Little wonder then that this will be the biggest and most representative exhibition except one (the Wembley Show) held in the history of the British Commonwealth.

Food Defence Plans and Canned Foods

As soon as the Food (Defence Plans) Department was set up the Food Manufacturers' Federation and the Fruit and Vegetable Canners' Association of Great Britain, which is affiliated to the Federation, were called into consultation by that Department. A Joint Committee consisting of the chairmen of the different canning sections of those organisations was set up as the recognised channel of communication between the Associations and the Department, and this Joint Committee has throughout kept in close contact with the Department for purposes of consultation upon canning matters.

During the past year the Associations have obtained and compiled, at the request of the Food (Defence Plans) Department, much detailed information regarding output, capacity, storage facilities and stocks, and materials used in the various branches of the food canning industry.

In order that the Department may be kept advised of any changes in the capacity and output of factories the collection of similar information will be continued next year, and by arrangement returns will in future be made direct to the Department.

As the Department is formulating plans for controlling supplies of canned foods and materials required by canners in the event of war, the continued co-operation of canning firms in supplying the necessary information is, of course, essential, and the Joint Committee have no doubt that this co-operation can be fully relied upon.

Lighting Provisions of the New Factory Act

A ROUND-TABLE public discussion on the lighting provisions embodied in the new Factory Act was held under the auspices of the Industrial Lighting Section of the Illuminating Engineering Society at the Home Office Industrial Museum, Horseferry Road, Westminster, London, S.W.1, on Tuesday, March 29, 1938, at 6.30 p.m.

Speakers representing the points of view of the employer, the employee, the lighting expert and the administration took part, including Mr. D. Gluckstein, of J. Lyons and Co., Mr. H. N. Winbolt, Assistant Secretary of the Safety First Association, Dr. S. English, President of the Illuminating Engineering Society, and Mr. E. W. Murray, of the Home Office Industrial Museum.

Opportunity to see Fuel Research

A VISITORS' Day is being arranged at the Fuel Research Station, East Greenwich, S.E.10, on Tuesday, May 31, 1938 (2 p.m. to 6 p.m.), similar to those held in previous years. Visitors will be given the opportunity of seeing the work in hand in the various laboratories, of inspecting the intermediate and large scale experimental plants installed at the Station, and of obtaining a general insight into the whole range of Fuel Research Work of the Department, the broad divisions of which are:

1. The Coal Survey.
2. The examination of coal and coke.
3. Preparation of coal for the market.
4. Carbonisation and complete gasification of coal.
5. Treatment of tar and liquid products from the hydrogenation of coal.
6. Synthesis of hydrocarbons and the production of lubricating oil.
7. Hydrogenation of coal.
8. Steam raising; combustion of pulverised coal, etc.
9. Miscellaneous (including testing of domestic fuels, smoke reduction, etc.).

Diet Saves Esquimo Babies

ALTHOUGH a healthy and organically sound race, the Esquimos are seriously susceptible to ailments which ordinarily cause white people only minor discomfort. Before the coming of the white man the Esquimos knew nothing of such common ills as cold, influenza, and other kindred ailments, and there had been no need for their bodies to build up a resistance to the attack of these diseases. Consequently the arrival of the first whaling and trading vessels each season was followed by widespread outbreaks among the natives, often with disastrous effects. To-day the medical services in the Far North take particular care upon the arrival of vessels to check the spread of these diseases. Modern hygiene has been a contributing factor to the physical well-being of the natives, and by instructions as to proper diets the doctors have reduced considerably the number of deaths due to dietary causes. A most striking success has been made in the correction of methods of feeding infants and older children, with the result that happy-faced, vigorous children now form a considerable portion of the population.

LOW TEMPERATURE STEAM TRAPS

MR. R. E. ASHTON, A.M.I.H.V.E., writes to the Editor about Mr. L. G. Northcroft's article which appeared last month.

I was glad to read Mr. Northcroft's article in the current issue of FOOD MANUFACTURE. Educative articles on elementary steam practice in industrial works are needed badly. It is rather a pity that Mr. Northcroft did not explore the subject of steam-trap practice more thoroughly. Had he done so, he would probably have qualified his remarks regarding what may be termed "low-temperature steam traps". As it stands, I suggest the reference he makes to this type of trap and its possible application is very misleading, and may possibly cause some of your readers to spend money to no purpose.

I am sure Mr. Northcroft is not seriously advocating water-logged coils except as a temporary measure pending proper equipment being installed.

When a heating coil is designed for a certain duty it is obviously necessary that the full heating surface should be used as originally intended. If heating surface is calculated on the basis of steam heating, then it is not going to be satisfactory for hot-water heating in whole or in part.

Assuming a "low-temperature trap" is set to pass condensate at 190° F., what is going to happen during the heating-up process when steam will be condensed at a much greater rate? I grant that during the first few minutes the temperature of the condense will possibly be sufficiently low to permit the trap to discharge full bore, but following this period the rate of condensation will be high and the condensate temperature will rapidly rise to above 190° or even 212° F. Banking up or water logging must then take place to an extent which will seriously impair the heat efficiency of the coil at a time when this is most needed.

The only circumstance that I can visualise where this would be tolerable is when the rate of heating up is not only of little importance, but where it just simply does not matter. In this case, I suggest that an undersized hand valve on the inlet, or a small by-pass feed round the main valve would be sounder practice. Also this instance presupposes that the manufacturer has bought and paid for more heating surface than he requires. I further suggest that a simple type of reducing valve to bring the steam pressure down to 5 lbs. per square inch or lower would be a more calculable solution than water logging the coils in inverse ratio to the heat demand.

The only satisfactory way of using "low-temperature traps" that I can see is to set the trap at frequent intervals, when it comes only a slight improvement on the good old "cracked valve" method, or to use a by-pass, when, of course, the installation becomes really dangerous from the point of view of steam wastage.

I am not suggesting for a moment that Mr. Northcroft is not as fully informed in these matters as I am, but I do submit that either too much or too little has been said in his otherwise excellent article. The instance he uses is unfortunate. Perhaps a better one may have been the draining of a separator, where the rate of formation of condensate is constant, or, at all events, within the capacity of a sluggish type of dribble trap such as Mr. Northcroft has in mind.

. . . and MR. NORTHCROFT replies.

The very interesting letter from Mr. Ashton raises such a number of points that I am glad of the opportunity of replying to it in your columns.

It will be noted that my article pointed out that low-temperature traps should be used when production times were not of primary importance. Mr. Ashton says that he can visualise the use of low-temperature traps when the rate of heating does not matter. There seems to be agreement on this point.

In what do we disagree? It seems to be on a point of the difference between theory and practice. If the heating coil under my glucose pan had been *designed* for steam heating, it is quite conceivable that it would be too small if it were not clear of condensate, but in practice such coils are seldom designed; they are just put in. Again, would Mr. Ashton design such a coil for the peak conditions of warming up or the running conditions of light load? If designed for peak conditions it would be too big for running conditions; if designed for running conditions it would be too small for heating up.

Mr. Ashton presumably knows that the use of a low-temperature trap does not *fill* the coil with water?

On this particular job I maintain that low-temperature traps do not need resetting as he suggests.

I personally would never consider using a low-temperature trap on a separator. On such a job condensate should be removed as soon as it forms. A float trap would be the ideal choice for this.

It all goes to show that no one kind of steam trap is equally suitable for each job.

Agriculture and War (*Continued from page 174.*)

character and qualities of the British race. Although the book is primarily directed towards rendering this country, by production and storage of food, more secure against war conditions, it also deals with the general adoption of long-view methods for home agriculture. "Hunger" is another word which recurs to an alarming extent in contemporary writings and speeches in connection with war. It is well to keep in mind that many view its inevitability in such circumstances as undoubted. Lord Lymington discounts the theory that the submarine menace has been ended by depth charges, and points out that those who believe this are shutting their eyes to the probabilities of new submarine technique. He analyses the dangers to which we are at present exposed and declares that a healthy agriculture in Britain would, with strong fighting forces, save us from fear of attack.

He gives the *pros* and *cons* of food reserves. He declares that "we have no food reserves and the public utterance of responsible politicians would imply neither need for large reserves nor intention to form them." The necessity for inland silos for wheat storage is stressed, as is also that for a substantial but temporary increase in the import of foodstuffs for livestock. It is agreed that for some national agency to go into the world grain market to buy available stores may be expensive, as wheat prices have shot up. But the author points out that the price of battleships has also increased. He declares that the arguments against a wheat reserve are no more than those of expediency. They sum up as being costly, as being difficult, as being possibly upsetting to international trade and as being possibly unnecessary. He then deals with the arguments in favour. The policy he strongly advocates is one year's supply for man and beast.

The dire effects upon national physique of bad food are touched upon, and in a long chapter the effect of bad husbandry upon the agricultural lands of the whole world is alarmingly described. Erosion is becoming one of many world problems. "The process of desert making goes on in winter and summer as well. In winter it drowns (by floods) while in summer it starves." This has affected the U.S.A., New Zealand, Australia and Africa. The *débâcle* of agriculture in the U.S.S.R. is predicted. "At present the United States has the world's greatest failure in farming, but Russia will ultimately have the record."

Lord Lymington discourses on the "Urban Desert" in this country. "From Battersea to Esher there runs a strip of alluvial market-garden land as valuable as any garden land in the world . . . we smear tawdry bricks and concrete like rancid margarine on the best land of Britain."

But the book does not consist of destructive criticism alone. The other side of the picture is given. The way is pointed to revaluation and reconstruction. In details, no doubt all farmers and politicians will not see eye to eye with Lord Lymington, but the general thesis of the benefits of the revival of British agriculture could hardly be quarrelled with by any but those unwilling to face those sacrifices which may become necessary in the earlier stages. W. G.

Famine in England. By Viscount Lymington. Pp. 271. London. 7s. 6d. net.

INFORMATION and ADVICE

Baumé Records—Canning in Tomato Sauce—Alcoholic and Acetic Concentration — Ham Tongues and Chicken Pastes — Sauce Manufacture — Bottling Chickens—Lecithin—Nitrite of Soda

Baumé Records

3,556. *I use a Baumé −0° to 45° for strengthening my syrups. Is it correct to assume that this same Baumé records correct readings for sugar and sugar-glucose syrups?*

Also can these readings be used in conjunction with the tables given for calculating the percentage of sugar in cane sugar solutions? (Ipswich.)

It is not correct to assume that the same Baumé records correct readings for both sugar and sugar-glucose syrups.

The Baumé hydrometer is calibrated on salt solution, but the tables give the percentage of pure sugar corresponding to the degrees Baumé.

It is very improbable that there exist tables giving sugar-glucose syrups, and the only thing that we can suggest is for you to make your own tables by dissolving known quantities of sugar-glucose and taking the degrees Baumé. Once you have done this, and provided that it is approximately the same quality each time, you would be able to get correct results.

Apart from this, sometimes mistakes are made because the Baumé is taken without completely mixing the materials. Once this occurs, bring the temperature of the liquid to be tested to a fixed point each time.

If you weigh out equal quantities of pure sugar and the glucose you are using, and dissolve them in the same amount of water, bringing them to a fixed temperature, you will find that the readings are different, and this will explain the lack of reconciliation of your figures.

Canning in Tomato Sauce

3,408. *I shall be glad if you could supply me with a recipe for canning pork and beans in tomato sauce, which pack I found most palatable when recently visiting your country.* (Central Europe.)

The dried beans are soaked from 12 to 16 hours. They are then blanched by submerging in hot water for about five minutes. The tomato sauce is made from pulp, sugar, starch, salt and condiments. The variation in the ingredients depends on the cost of the sauce.

Sometimes the blanched beans are dried in retorts prior to filling into cans, in order to get a brown colour, but by packing and processing at 250° F. the necessary brown may be obtained.

The processing ranges from 60 to 150 minutes, according to the size of the can.

Alcoholic and Acetic Concentration

3,420. *How much acetic acid does vinegar contain at 90 grains?*

At what units of capacity do the 90 grains refer?

How can I establish an equivalence table between the British system of evaluating the strength of vinegar and the metric system in use in France for alcoholic and acetic concentration? (France.)

The manufacturer distinguishes vinegars of different strengths by the number of grains of pure dry sodium carbonate required for the neutralisation of 1 fluid ounce. Thus, proof vinegar is known as 24, from the fact that 24 grains of sodium carbonate are required for the neutralisation of 1 ounce.

The weaker qualities are Nos. 22, 20 and 18. As 60 grains of absolute acetic acid of 51 acetic anhydride are neutralised by 53 of sodium carbonate the number of the grains of the real acid contained in each fluid ounce of the vinegar can be ascertained by multiplying the number of the sample by 1·132. If the number of the sample is multiplied by the factor 0·259, the product will be the parts by weight of absolute acid in 100 measures of vinegar, or grams per 100 c.c.

Ham Tongues and Chicken Pastes

3,462. *Can you please give us a recipe for ham and chicken paste, as well as for ham, tongue and chicken paste?* (Norway.)

The following suggestion is for ham and tongue pastes, the addition of chicken depending on quality desired:

Corned beef	3½ lb.
Boiled bacon	1 ,,
Boiled tongue	1 ,,
Butter or margarine	1 ,,

For seasoning:

White pepper	½ oz.
Ground parsley	½ ,,
Marjoram	½ ,,
Cayenne pepper	½ ,,

Salt added at discretion, and, if filling is added, the amount of seasoning must be brought up to the required proportion.

Sauce Manufacture

3,441. *We are contemplating the manufacture of sauces, and we would be glad if you will kindly put us in touch with the machinery manufacturers and inform us where we can obtain similar sauce recipes.* (Leeds.)

The following is a typical recipe for fruit sauce:

Dates	1½ boxes
Apple pulp	2 gal.
Tomato pulp	1 ,,
Onions	18 lb.
Garlic	2 ,,
Salt	4 ,,
Cayenne	1½ ,,

Ginger	1½ ,,
Vinegar (16 gr.)	26 gal.
Acetic acid (80 per cent.) ..	½ ,,

Peel and chop onions and garlic. Soak ground spices in water for 48 hours. Gently simmer all for 30 minutes. Pass through a fine sieve. Bottle at over 185° F.

Another sauce that you might experiment with is as follows:

Liver	3 lb.
Sultanas	2½ ,,
Tamarinds	3½ ,,

are boiled in water until a thick pulp is obtained. This is then forced through a sieve and introduced into a steam-pan. The following ingredients are then added:

Tarragon vinegar	1 gill
Soy	2 gal.
Lemon pulp	2 ,,
Orange pulp	1 ,,
Walnut ketchup	1¼ ,,
Mushroom ketchup	2¼ ,,
Vinegar, No. 20	11½ ,,
Gum tragacanth (wet)	7 ,,

(This is by taking 7⅜ lb. of ground gum and allowing it to soak in 9 gal. of No. 20 vinegar, with frequent stirring.)

Demerara sugar	73 lb.
Salt	1¾ ,,
Tins tomato purée	7 × 5 kilo.
White wine vinegar	9 gal.
Ground black pepper	6 oz.
Ground white pepper	6 ,,
Ginger (ground)	1⅛ lb.
Mixed spice	¾ ,,
Cayenne	6¼ oz.
Bay leaves	1 ,,
Ground coriander	6 ,,
Garlic powder	1 ,,
Ground nutmegs	6 ,,
Ground cloves	3 ,,
Lemon peel	1 lb.
Treacle	12 oz.
Tomato sauce	12½ gal.
Ground celery seed	1½ lb.
Salicylic acid	2½ oz.

The mixture is then boiled for 15 minutes, allowed to stand for 1 hour, and finally strained through a hair sieve.

Bottling Chickens

3,694. *We have been experimenting with bottling chickens and we find that the greatest trouble at the moment is preventing fat rising from the chickens and spoiling the appearance after the bottles are closed. Is it possible to prevent this? We were wondering whether if we were to dip the chickens before boiling in hot arachis oil it would prevent it. We shall be glad if you can help us in this.* (Scotland.)

In our opinion, it would be impossible to prevent fat rising from the chickens during retorting. With regard to dipping chickens in hot oil, this might remove a small proportion of the fat, but we do not think it would get over the difficulty. If you are desirous of testing this, it would be quite easy to do so.

Lecithin

3,642. *I understand that lecithin is currently employed by chocolate manufacturers, and I would like to know what are the characteristics, both physical and technical, of a good commercial lecithin.* (France.)

We quote the following, which appeared some time ago in FOOD MANUFACTURE:

"Chemically the substance is a 'lipoid', and is distinguished from the ordinary fats by the presence of a phosphoric acid radical in the molecule. In very small quantities it occurs in animal and vegetable tissues, and as far back as the nineteenth century phosphorus was recognised among the constituents of the brain. Egg-yolk contains the largest amount of lecithin—viz., 8 to 10 per cent. It is for this reason that the lipoid obtained the name 'lecithin', based on the Greek for egg-yolk.

The soya bean, containing up to 2 per cent., comes next in importance as the source of a valuable compound. Owing to the prohibitive cost of lecithin when extracted from such an expensive raw material as egg-yolk, much has been done on extracting the substance from soya beans. Based on alcohol and benzol extractions, a process is now in commercial operation producing lecithin in large quantities at a reasonable price.

The commercial product is a dark brown paste containing about 60 per cent. lecithin, the remainder being pure soya oil, with small quantities of phytosterol. In a general way, lecithin seems to act on fats as a protective colloid, and it tends to prevent the separation of fractional constituents. When cooled, liquefied fats containing lecithin solidify to a homogeneous mass, and this effect is clearly shown in the case of cocoa butter, which normally crystallises in stages, commencing from the outside.

The margarine industry absorbs a considerable amount of this lipoid, as its incorporation overcomes many of the differences between butter and its substitute—*e.g.*, it binds the water and so prevents spitting when frying: it is a normal constituent of butter, etc. Naturally, lecithin is of great interest in the chocolate industry, whose products depend so much on the correct use of fats such as cocoa butter and those occurring in milk powder".

We recommend the following book, and could obtain it for you if you wish: *Lecithin and Allied Substances: The Lipins*, by Hugh Malcolm. 10s. 6d.

Nitrite of Soda

3,537. *Will you please give me fuller information regarding the use of nitrate of soda as a colour-fixing agent in meat curing. I tried to obtain nitrite of soda from a chemist, but was told that it was poisonous in large quantities.* (Salford.)

Unfortunately, the regulations of this country prohibit the use of this substance. The use of nitrite is permitted in the United States and Germany.

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NEW COMPANIES

W. H. Adams (Bottlers), Limited. (338276.) Mar. 23. Mnfrs., distillers, and bottlers of and dlrs. in beer, wine, spirits, mineral and aerated waters, etc. £3,000. Permt. dirs.: C. Adams, 59, Longwood Road, Barr Beacon, near Walsall; W. J. Hickmans, 13, Oak Crescent, Wolverhampton; Doris H. Adams and W. E. Whitehouse.

George Bradley and Company, Limted. (337936.) Mar. 16. 19, Farrence Street, London, E. 14. Mnfrs. of and dlrs. in chocolates, sweets, etc. £100. Dirs.: S. Davis, 18, Rosecroft Avenue, Hampstead, N.W. 3; M. Przelomski, Tamka 33a, Warsaw.

Cairo Coffee Works, Limited. (338235.) Mar. 23. Fisher's Court, Besson Street, New Cross Gate, London, S.E. 14. Mnfrs. of and dlrs. in coffee and other essences, etc. £1,000. Life dirs.: A. H. Doctor, 11, Pepys Road, S.E. 14; J. H. Bloomfield, 90, Newquay Road, S.E. 6; N. Brockman, 24, Balnacraig Avenue, N.W. 10.

Cavey's Limited. (337983.) Mar. 17. Corn, flour and seed merchants, grocers, etc. £10,000. Dirs. to be appointed by the subs.

Cottingham Bros., Limited. (337830.) Mar. 12. Enterprise Works, Digby Street, Scunthorpe, Lincs. Mnfrs. of and dlrs. in confectionery, foodstuffs, etc. £500. Dirs.: R. F. Cottingham, Hycott, West Cliff Gardens, Scunthorpe, Lincs; S. Cottingham, 18, Queen Street, Market Rasen, Lincs.

Fowler Bros. (Preserves), Limited. (338058.) Mar. 18. Jam manufacturers. £20,000. Dirs.: W. H. Fowler, Case Reeds, Rickmansworth Road, Watford, Herts; A. E. D. Fowler, Lyncroft, Shepherd's Road, Watford.

A. T. Gaze, Limited. (338037.) Mar. 18. Wholesale milk contractors, grocers, provision mchts., etc. £15,000. Dirs.: A. T. Gaze, 94, Broadway, Cardiff; Emily D. Gaze and R. A. T. Gaze, 363, Newport Road, Cardiff; Florence Roper, 117, Penylan Road, Cardiff.

Hedley Bell and Sons, Limited. (337623.) Mar. 7. Camgate Works, Stanwell, Middlesex. Dlrs. in butchers' waste products. £5,000. Dirs.: H. Bell and H. S. Bell, 237, Ellerdine Road, Hounslow; J. Davis, The Gables, Bassett Avenue, Bassett, Southampton.

Percy's (Sweets), Limited. (337709.) Mar. 9. 8, Ormerod Street, Burnley. Mnfrs. of and dlr. in boiled and other sweets, chocolates, etc. £500. Dirs.: R. Knowles, 66, Caryl Road, St. Annes, Lancs; P. Cullingworth, 48, Orchard Avenue, Blackpool.

E. A. and M. A. Smith and Company, Limited. (338239.) Mar. 23. Bakers and confectioners. £2,000. Dirs.: Elizabeth A. Smith and Margaret A. Smith, 395, Lytham Road, Blackpool; Eliza Smith, 21-3, Lytham Road, Blackpool.

Stephens and Pope, Limited. (333224.) 1/11/37. To take over the bus. of a wholesale provision mcht. cd. on at Grants Walk, St. Austell, Cornwall, as "Stephens and Pope". £15,000. Permt. dirs.: A. L. Pope, 31, Trevarthian Road, St. Austell; Mrs. B. M. Pope, 31, Trevarthian Road, St. Austell.

Toast Products, Limited. (338195.) Mar. 21. Abbey House, Baker Street, N.W. 1. Biscuit mnfrs. and bakers; to acquire the U.S. Letters Patent relating to toast products and toasting machines, etc. £5,000. Dirs.: H. C. S. Thomson, 32, Lansdowne Road, N.; P. E. Foss, Flat 7, 126, Streatham Hill, S.W. 2; E. M. French, 5, The Head, West Wickham, Kent; D. R. Macdonald, 32, Northwick Avenue, Harrow-on-the-Hill, Middlesex.

Tower Food Products, Limited. (338025.) Mar. 17. 1, Stanmore Avenue, Blackpool. Manufacturing confectioners, mnfrs. of and dlrs. in foodstuffs, etc. £1,000. Dirs.: T. Wilson, Denby, Whinney Lane, Langho, near Blackburn; J. Wareing, 7, Alderley Avenue, Blackpool; W. L. Williams, 2, Leopold Drive, Blackpool

Vita-Glucose, Limited. (338197.) Mar. 21. To acquire that branch of A. L. Simpkin and Co., Ltd., relating to the mnfre. of glucose tablets for food, etc. £200. Dirs.: To be appointed by the subs.

Worthing Hydro, Limited. (337551.) Mar. 4. Arundel House, Liverpool Gardens, Worthing. Hydro and hotel keepers, etc. £25,000. Permt. dirs.: Lt.-Col. J. R. Dalwood, 21, Cumberland Mansions, N.W. 6; Mrs. N. Hillman, 6, Clarence Court, Worthing; A. Dickson-Wright, 11, Wimpole Street, W. 1; E. C. Dayus, M.R.C.S., L.R.C.P., 12, Ashburn Gardens, Kensington, S.W. 7.

The above-mentioned particulars of new companies recently registered have been extracted from the daily register of Messrs. Jordan and Sons, Ltd., company registration agents, Chancery Lane, W.C. 2.

TRADE MARKS

This list of Trade Marks of interest to readers has been selected from the "Official Trade Marks Journal", and is published by permission of the Controller of H.M. Stationery Office. The "Trade Marks Journal" can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C. 2, price 1s. weekly (annual subscription £2 10s.).

ASCORBIN.—584,031. **Substances used as food or as ingredients in food.** ROWNTREE AND CO., LTD., The Cocoa Works, Wigginton Road, York. March 30.

COWBOY. — 580,783. **Corn flakes and canned fruits.** IDEAL PRODUCTS, LTD., 170, Howard Street, Glasgow, C. 1. (By consent.) April 6.

CRETOLA. — 584,054. **Cream of tartar substitutes for use as ingredients in food.** DE BRUYN, LTD., Unilever House, Blackfriars, London, E.C. 4. April 6.

MACKINTOSH'S PAN TOFFEE.—579,924. **Toffee.** JOHN MACKINTOSH AND SONS, LTD., Albion Mills, Waterside, Halifax, Yorkshire. (Associated.) (By consent.) April 6.

Registration of this trade mark shall give no right to the exclusive use of the word "Pan".

ODIN.—583,812. **Beef and veal products in tins and jars.** GEORGE WILLIAM MAWER, trading as Edward Culley and Co., 32, Prudhoe Street, Newcastle-on-Tyne, 2. March 30.

OURMAR. — 583,962. **Edible oils and edible fats.** THE SOUTHERN OIL CO., LTD., Westinghouse Road, Trafford Park, Manchester. March 30.

PRIMROSE.—582,987. **Ice-cream powders.** E. RAPER AND CO., LTD., Dee-lish-us Works, Belmont Park Road, Leyton, E. 10. April 6.

Ice-cream and goods of the same description will be struck out from the goods of Registration No. 21,138 (181) if and before the applicants' mark is registered.

SCOBRITMAR.—583,963. **Edible oils and edible fats.** THE SOUTHERN OIL CO., LTD., Westinghouse Road, Trafford Park, Manchester. (Associated.) April 6.

SEA HAWK.—580,730. **Canned fish and canned fish cakes.** A/S EINAR HAUSVIK AND CO., 4, Strand-kaien, Bergen, Norway. April 6.

580,260.—**Substances used as food or as ingredients in food, but not including cereals, flour, digestive meal, or other similar products of grain.** CO-OPERATIVE WHOLESALE SOCIETY, LTD., 1, Balloon Street, Manchester. (Associated.) April 6.

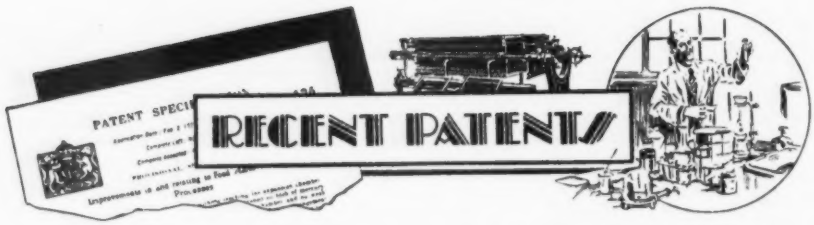
WHEAT SHEAF. — 580,243. **Substances used as food or as ingredients in food, but not including cereals, flour, digestive meal, or other similar products of grain or vinegar, and not including any goods of the same description as vinegar.** CO-OPERATIVE WHOLESALE SOCIETY, LTD., 1, Balloon Street, Manchester. (Associated.) April 6.

WHOOPEE.—583,866. **Cooking fats and butter.** LATIMER IVEY, 12a, Disraeli Gardens, London, S.W. 15. March 30.

574,789.—**Tea.** CEYLON TEA GROWERS' ASSOCIATION, LTD., Ceylon House, Triumph Road, Nottingham, and 47, Mark Lane, London, E.C. 3. January 19.

Registration of this trade mark shall give no right to the exclusive use of the letters "C.T.G.A." or of the word "Flowery".

576,079.—**Preparations for making beverages, and fruit beverages, not alcoholic, not aerated, and not medicated.** NEWBALL AND MASON, LTD., 90, Beech Avenue, New Basford, Nottingham. (Associated.) February 2.



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Latest Patent Applications

4041. AKTIEBOLAGET SEPARATOR: Vessels for testing milk. March 24.
6717. DAM, F. C.: Machine for cleaning intestines. March 3.
7203. BOEHMER, J. M.: Food dispensers. March 8.
7543. MADAUS, G., MADAUS, F., and MADAUS, H.: Foodstuffs. March 19.
7816. HUTTON, W., and BARKLEY, J.: Machine for treating meat. March 14.
7824. BROWN, R. H.: Machines for shelling, etc., cereals. March 14.
8092. YAMAMOTO, S.: Preparation, etc., of tinned peas. March 16.
8383. LYONS AND CO., LTD., J., and GLUCKSTEIN, L.: Preservation, etc., of perishable articles. March 18.
8475. GES. FÜR PATENTVERWERTUNG: Refrigeration of foodstuffs. March 18.
8535. BROWN, A.: Devices for subdividing masses of butter, etc. March 19.
8692. GRETHE, T.: Treatment of tea. March 21.
9131. KELLIE AND SON, LTD., R., and KELLIE, R. W.: Machines for filling jars with preserves. March 25.
9646. COHEN, H.: Foodstuffs. March 29.
9769. HUZENLAUB, E. G., and ROGERS, J. H.: Apparatus for treating cereals, etc. March 30.
30404. GROSSMANN, G.: X-ray apparatus. (Germany, November 5, 1936.)
30441. ALLEN, H. E.: Processed sausages. (United States, June 12.)
30502. DOWNES, M. J.: Cooking ovens, etc.
30570. BIGGS, F.: Flexible drinking-cups, etc., for bottles containing beverages.
30684. BOGNER, F.: Manufacture of tins, etc.
30734. FRASER, J. G.: Oven heating-units.
30829. HUXLEY, W. G.: Distributors for grain, etc.
30857. CORPORAÇION ARGENTINA DE PRODUCTORES DE CARNES: Wrappings, etc., for tins, etc.
30872. BASINGSTOKE ENGINEERING CO.: Machines for peeling potatoes, etc.
30880. BRITISH THOMSON-HOUSTON CO., LTD.: Boiling plates for electric cookers.
30952. DENISON, C.: Extraction of oils and fat.
30996. CHERRY-BURRELL CORPORATION: Closures for bottles, etc. (United States, November 12, 1936.)

Complete Specifications Accepted

477,670. FAIRWEATHER, H. G. C. (COFFEE PRODUCTS CORPORATION): Manufacture of concentrated coffee extract.
478,241. STEVENS, A. H. (INDUSTRIAL PATENT CORPORATION): Sausage casings and methods of preparing same.
478,528. WEBSTER, R. W.: Closure caps for bottles, jars, and like vessels.
478,570. WEIZMANN, C.: Yeast or protein preparations.
478,627. COLOMBO COMMERCIAL CO., LTD., YOUNG, A.: Apparatus for grading manufactured or partially manufactured tea-leaf or other similar substances.
478,629. ELION, L.: Finely granular kitchen salt preparations.
479,116. HEUTSZ, J. B. VAN: Apparatus for preserving substances of vegetable and animal origin by desiccation. (May 27, 1936.)
479,156. MCCROSSON, J. T.: Apparatus for supplying gas and/or syrup to containers for food and like products while under vacuum. (November 27, 1936.)
479,233. PIQUE, J. J.: Storage of foodstuffs. (December 18, 1936.)
479,585. LAMBINON, G.: Process for the manufacture of crystallised sugar. (June 8, 1936.)
479,715. DUVAL, M. H., and VEZIN, R.: Cooling apparatus for treating bakery products. (April 3, 1936.)
479,810. CLAYTON, W., MONTGOMERIE, J. A.: Preparation of dried products. (April 5, 1937.)
479,976. BAKER, G. L.: Treatment or purification of pressed starchy-pectin-containing materials. (July 29, 1936.)
480,063. KOSMOS NEUHEITEN GES., and RUDIGER, E.: Evaporatively cooled refrigerators for storing food. (May 6, 1936.) (Cognate Application 12959/37.)
480,096. ROSENFELD, B.: Extraction of pectins. May 13, 1936.
480,232. MANTELET AND BOUCHER: Mills for grinding pepper, salt, sugar, coffee, and the like. (August 18, 1936.) (Cognate Application 19674/37, 19675/37, and 19676/37.)

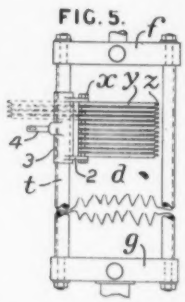
Printed copies of the full Published Specifications may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C. 2, at the uniform price of 1s. each.

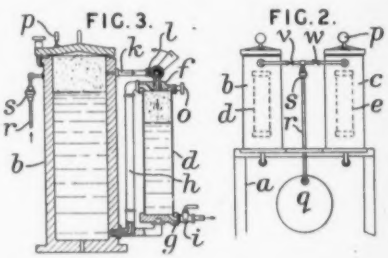
Abstracts of Recent Specifications

Group Abridgments can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C. 2, either sheet by sheet as issued on payment of a subscription of 5s. per Group Volume, or in bound volumes price 2s. each.

471,620. GROUP VI. **Preserving meat.** HIRSCHMANN, O.
Apparatus for preserving meat by injection of brine or other preservative liquid consists of a container *b* and a measuring vessel *d* for the liquid, which are in direct communication by a pipe *h*, the flow of the liquid into the vessel *d* being effected and regulated by supply of compressed air through a pipe *r* and a reducing valve *s* to the container *b*. A pipe *k* supplies compressed air from container *b* to the vessel *d* to expel the liquid therefrom through a cock *i* to which the injection needle is connected, the pipe *h* having a three-way valve *l*, which also enables the vessel *d* to be connected to atmosphere while it is being filled from container *b* through pipe *h*. As shown, two containers *b*, *c*, Fig. 2, and their measuring vessels *d*, *e*, are supported on a frame *a* with a common supply of compressed air from a vessel *q* to each container through a control valve *v*, *w*. A device for measuring the supply

FIG. 5.





of liquid from the vessel *d*, which is made of glass or other transparent material, consists of a number of similar rods *y*, Fig. 5, pivoted on a vertical shaft *x* and provided at their ends with indentations *z*, each half the depth of a rod. The shaft *x* is carried by arms 2 on a sleeve 3 adjustably mounted and fixed by a screw 4 on one of a pair of supporting columns *t* between the base *g* and cover *f* of the vessel *d*. The amount of brine used is determined by the weight of the piece of meat, the width of each rod *y* corresponding, for example, to ½ kg. and of each indentation *y* to ¼ kg., as many rods as correspond with the weight of the meat being swung in against the vessel *d*. Manometers *o*, *p* indicate the pressure in vessel *d* and container *b*.

474,905. **Curing pork.** JERNE, H. J.
In curing pork by pickling or dry salting, lactic acid is added to the curing material. The pork may be immersed in the pickle, or the pickle may be injected into the pork, and in dry salting the curing material may be spread over the meat, or the meat placed in the material. The amount of lactic acid used is preferably about 0·1 per cent. by weight of the dry salt mixture or of the pickle, and lactic acid of meat is preferably used. The curing may be effected at 10° C. Sugar may also be added and saltpetre may be entirely or partially omitted.